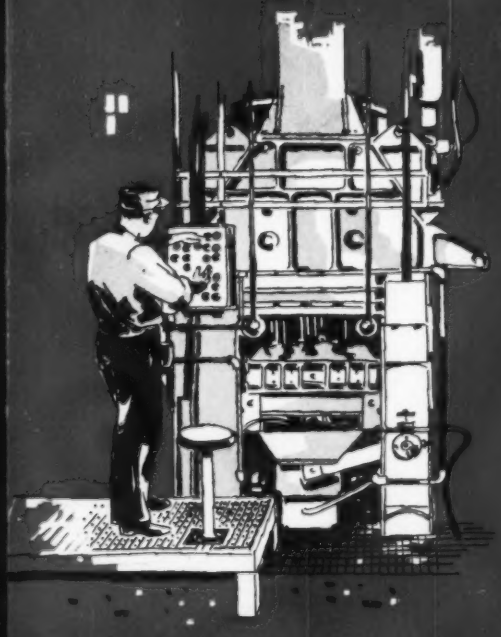
JUNE
1961

FOUNDRY

A PENTON PUBLICATION



A New Concept of

MECHANIZED PRODUCTION

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AFS Congress Reports

— Pages 66 and 142

THIS MONTH'S FEATURES—

Foundry Practice with Furan Binders
— Page 73

Using H-13 Steel in Diecasting Dies
— Page 76

Why Pinhole Porosity in Gray Iron?
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How To Gate Shell Mold Castings
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METALGRAMS

. . . news of "Electromet" ferroalloys and metals

UNION CARBIDE METALS

JUNE 1961

NEW ECONOMIES IN MAKING STAINLESS -- New oxygen-blown refined chrome allows savings three ways: (1) The alloy has a lower price due to economies in oxygen blowing ferrochrome. (2) Reduced carbon and silicon contents allow greater use of this low-cost chromium in the charge. By using more refined chrome in the charge, less chromium as low-carbon ferrochrome is needed later in the heat. (3) Less lime is needed to neutralize silica formed during decarburization. (The lower silicon content of the alloy forms less silica.) For more information, call your UCM representative or write for "Even Alloys are Oxygen Blown" in the Summer 1961 issue of UNION CARBIDE METALS REVIEW.

For more information circle 551 on page 39

* * *

MORE STAINLESS SAVINGS -- Stainless foundrymen are making big savings by using ferromanganese-silicon for finishing additions of silicon and manganese. Assuming 100 per cent recovery, $2.86 per ton can be saved for a 1 per cent manganese and accompanying 0.45 per cent silicon addition. The alloys replaced are electrolytic manganese and ferrosilicon. Several foundries also report getting cleaner steel when using ferromanganese-silicon. Write for F-20,093 for further information.

For more information circle 552 on page 39

* * *

SILICON IMPROVES ALUMINUM CASTINGS -- Almost all aluminum castings contain silicon. The element improves castability, allowing adequate filling of thin sections and complex shapes. It also lowers the coefficient of thermal expansion and reduces hot shortness and cracking. A choice of six grades of "Electromet" silicon metal are available for additions to aluminum casting alloys. For more silicon data plus how the auto industry uses silicon in castings, write for the article, "Aluminum Auto Castings Grow," in the Fall 1960 issue of UNION CARBIDE METALS REVIEW.

For more information circle 553 on page 39

* * *

VANADIUM...PUTS MUSCLE IN IRON -- About 0.10 to 0.15 per cent vanadium increases the strength of cast iron by 10 to 25 per cent. It also adds toughness and produces uniform hardness in heavy sections. Vanadium cast irons are therefore used in steam and diesel-engine parts, dies, and rolling-mill rolls. For additions to cast iron, Union Carbide Metals offers a special foundry grade of ferrovanadium that has good solubility in iron. Contact your UCM representative for more information. Also, ask for the article, "The Elements That Surround Us: Vanadium," in the Summer 1960 issue of UNION CARBIDE METALS REVIEW.

For more information circle 554 on page 39

* * *

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Union Carbide Canada Ltd., Toronto.

"Electromet" and "Union Carbide" are registered trade marks of Union Carbide Corporation.

"F" Nickel shot gives gray iron castings the extra life your customers want

When you add Inco "F"* Nickel shot to a ladle of molten gray iron, you greatly improve your control over the metal structure and add appreciably to the service life of the castings.

For example, you can boost tensile and compressive strengths, rigidity, and the response of the part to heat treatment. "F" Nickel increases the resistance of the castings to wear, to mechanical and thermal shock, to high temperatures. It promotes development of a uniform density across thick and thin sections. It even improves the chill control in castings.

As you will quickly recognize, many of these effects do more than add a service-life extra. They also help you overcome many of the factors that make for rejects and increase your costs.

How can "F" Nickel control so many factors?

"F" Nickel was specially developed by Inco for ladle addition to gray iron. It provides Nickel (92%) and silicon (5.5%) in a desirable balance and in forms that go into solution in the melt at a low 2300°F. Nickel works together with the carbon to help you establish desirable pearlitic matrices with excellent dispersion of properly sized graphite flakes.

For easy ladle addition, Inco's distributors supply Inco "F" Nickel shot in 500-pound drums.

For more information on the improvement of gray iron with Inco "F" Nickel, write for our useful, 32-page booklet, "Engineering Properties and Applications of NICKEL CAST IRONS."

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

Foundry after foundry reports:

Good-rite CB-40 decreases blows, improves tolerances, simplifies baking

Now that foundrymen have had more than two years experience with Good-rite CB-40, here's a summary.

Low-gassing. Even in the most complicated cores, there is a "decreased tendency for blows." The exceptionally small amounts of gas mean that, in case after case, blow holes are eliminated. Scrap is reduced. Finer sands are being used, producing additional savings through reduced machining requirements.

Excellent dimensional stability. Core distortion is eliminated because no chemical reaction is required. Baked cores accurately reproduce the core boxes and can be hardened in unheated boxes for extremely close tolerances.

Less critical baking. Here are more comments: "We've learned that both time and oven temperature can be far less critical." And "Now we operate without concern for exact temperature that was created by other types of binder." Large and small cores can be baked simultaneously in the same core oven, without overbaking or underbaking either size.

Additional information. You can get complete information about Good-rite CB-40, including names of people who are profiting with it by writing, Department PD-3, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical
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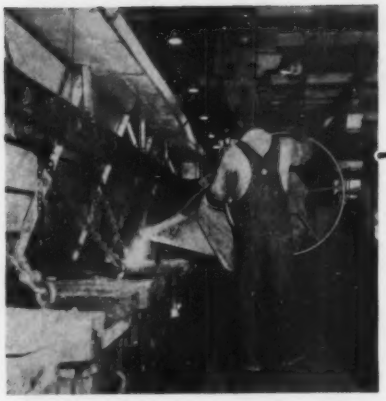
Good-rite CHEMICALS

June 1961
Volume 89—Number 6

FOUNDRY
A PENTON PUBLICATION



Mass production of castings at Pontiac Motor Div. involves careful scheduling as well as an efficient layout of equipment. This and other considerations are discussed in the article starting on Page 62. Above view is of the pouring station of one of the lines.

Convention Impressions 61
Editorial—By WILLIAM G. GUDE

Mechanized Castings Production 62
Mass production of castings is as much a concept of planning as of equipment installation. This article describes the evolution and application of mechanization at Pontiac Motor Div., GMC—By ROBERT H. HERRMANN

65th AFS Castings Congress 66

Reports on AFS Technical Sessions 142
Reports in this issue cover gray iron; brass and bronze; heat transfer; light metals; patternmaking; safety, hygiene, and air pollution; malleable iron; and industrial engineering and cost. The rest will be presented next month

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- Heat Transfer 161

The Furan Family of Binders 72
One of the most recent developments in coremaking has been the development of binders of the furan family. Here is a concise description of the origin, nature, and use of these binders—By ROBERT J. MULLIGAN

How To Work Furan Binders into Production . 73
The Truck Engine Plant foundry of International Harvester Co., Indianapolis, got into the use of furan binders early, in the spring of 1960, when it ran into a need for increased core production—By JOSEPH CUMMINGS

Using H-13 Steel in Diecasting Dies 76
Here is a comprehensive review of important points in relation to the properties and applications of H-13 hot work tool steel, the most popular type in use for diecasting dies—By ARTHUR E. SCHOLZ

What Causes Pinhole Porosity in Gray Iron? . 80
Pinholing has plagued gray iron foundrymen for many years. In this article, the author discusses a likely cause of the problem and describes experiments which led to his conclusions—By ERNEST HAACK

Gating Shell Mold Castings 84
The 21st article in our gating and risering series points out that with modifications, general principles employed in gating of green sand castings can be used in shell molding—By P. J. AHEARN and F. C. QUIGLEY

Sales-Minded Foundrymen 88
Sales-minded foundrymen know that nothing has value until it has been sold, and nothing is sold until it has been produced and delivered. Both functions call for creativity—By T. E. BARLOW

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Inventors should file for a patent as soon as an invention is perfected and should prosecute actions for infringement without delay—By A. W. GRAY

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FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

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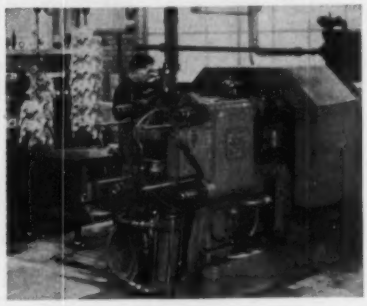
THE EDITORS' WORKSHOP

FLEXIBILITY: Jobbing diecasters face the problem of utilizing casting machines as much as possible while minimizing storage and handling of raw and partly finished castings. Wolverhampton Die Casting Co.

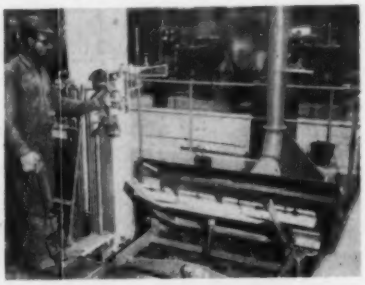


Ltd., major European producer of zinc-alloy diecastings, has overcome this problem. (See Hiram Barton's article next month.)

OLD IRON: Cast iron pressure pipe serving the palace of Versailles in France still is in use after 300 years. Chemical composition made recently of a small section raises some interesting metallurgical questions. Warren Jeffery of McWane Cast Iron Pipe Co. will discuss the subject in a coming article.

NEW FOUNDRY: Neptune Meter Co. based its decision to build a new foundry for brass and bronze meter castings on belief in the projected growth of the country.

The modern, new shop at Mas-

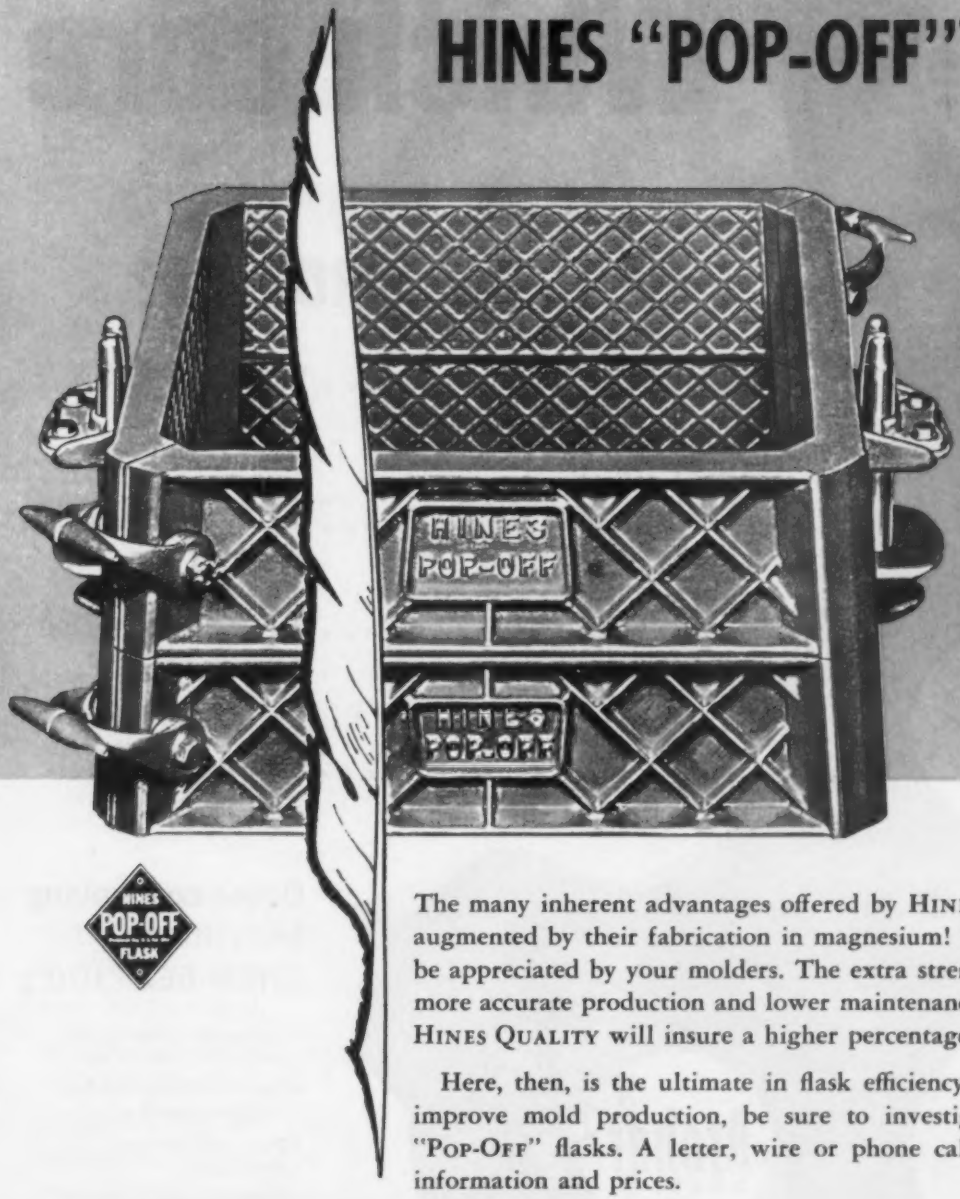


peth, Long Island, has wide versatility in handling different work and an unusual mobile core storage and delivery system.

A full description of the operation will be presented next month.

MAGNESIUM

HINES "POP-OFF"® FLASKS



UP TO 25% LIGHTER!

STRONGER, *too!*

SIZES AVAILABLE IN MAGNESIUM:
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The many inherent advantages offered by HINES "POP-OFF" flasks are augmented by their fabrication in magnesium! The lighter weight will be appreciated by your molders. The extra strength will give you even more accurate production and lower maintenance costs. And, as always, HINES QUALITY will insure a higher percentage of perfect molds.

Here, then, is the ultimate in flask efficiency! If you're planning to improve mold production, be sure to investigate HINES *magnesium* "POP-OFF" flasks. A letter, wire or phone call will bring additional information and prices.

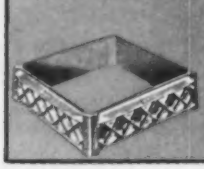
HINES CAST JACKETS

Used with HINES "POP-OFF" flasks, they'll provide economical, quantity production.

Less investment!

No stacks of tight flasks taking up valuable space!

Lower shake-out costs!



HINES

FLASK COMPANY

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IF IT'S A "POP-OFF"... IT'S HINES... IF IT'S HINES... IT'S THE BEST

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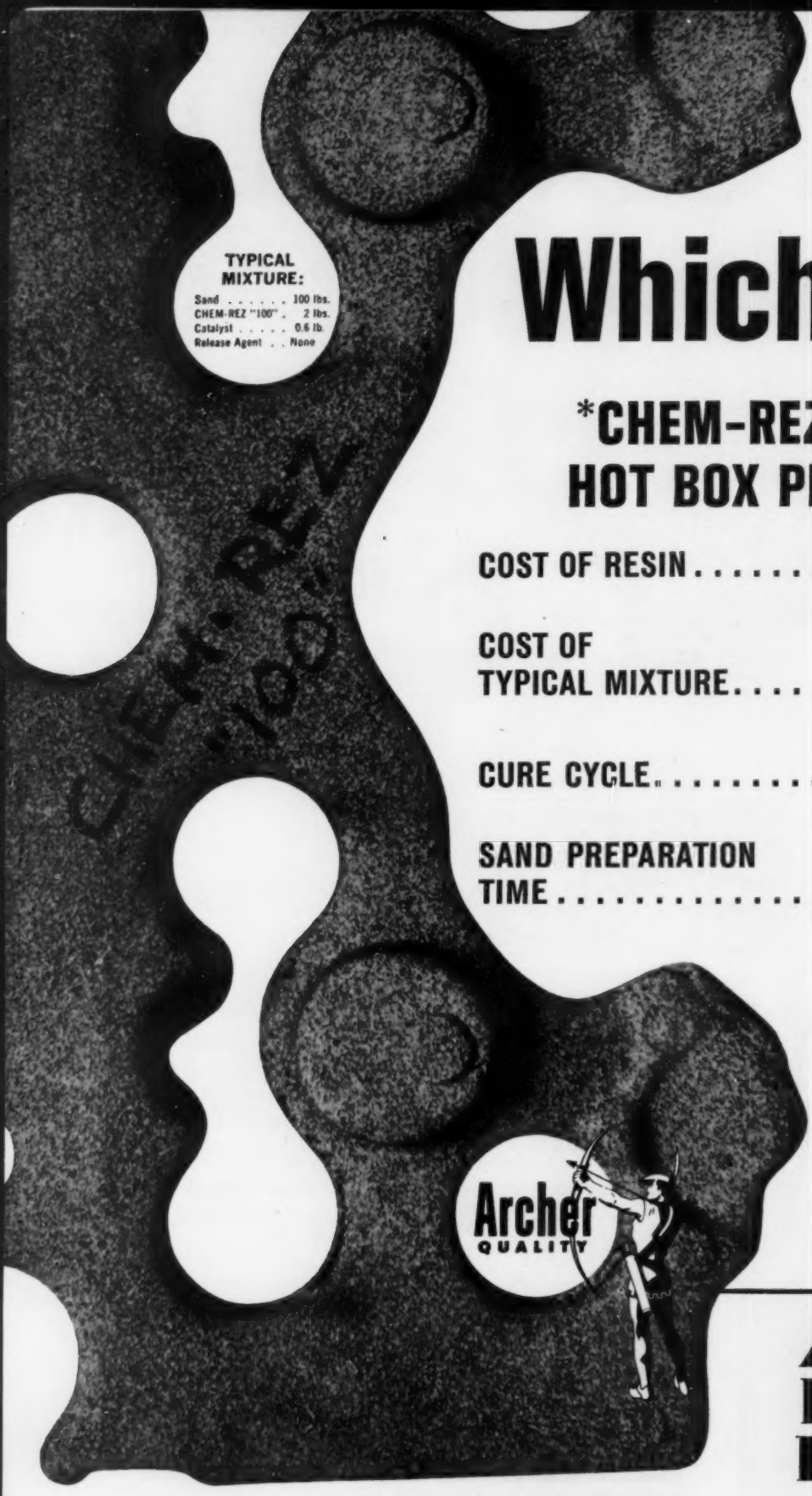


Which core

*CHEM-REZ "100" HOT BOX PROCESS?

COST OF RESIN . . . . . 16.3¢ per lb. delivered**

COST OF TYPICAL MIXTURE . . . . . 37.4¢ per 100 lbs. of sand

CURE CYCLE . . . . . 30 sec. at 400 to 450°F.

SAND PREPARATION TIME . . . . . 1½ to 3½ minutes

Other cost-saving benefits of CHEM-REZ "100":

- Existing core blowers and sand mixers can be used.
- Positive collapsibility; fast, complete shakeout.
- Clean, safe working atmosphere.
- Process is easy to install.

Archer-Daniels-Midland

*In Canada, manufactured and sold under the trade-name, ADMIREZ "100".
**East and North of Kansas City. Price subject to change without notice.

costs less?

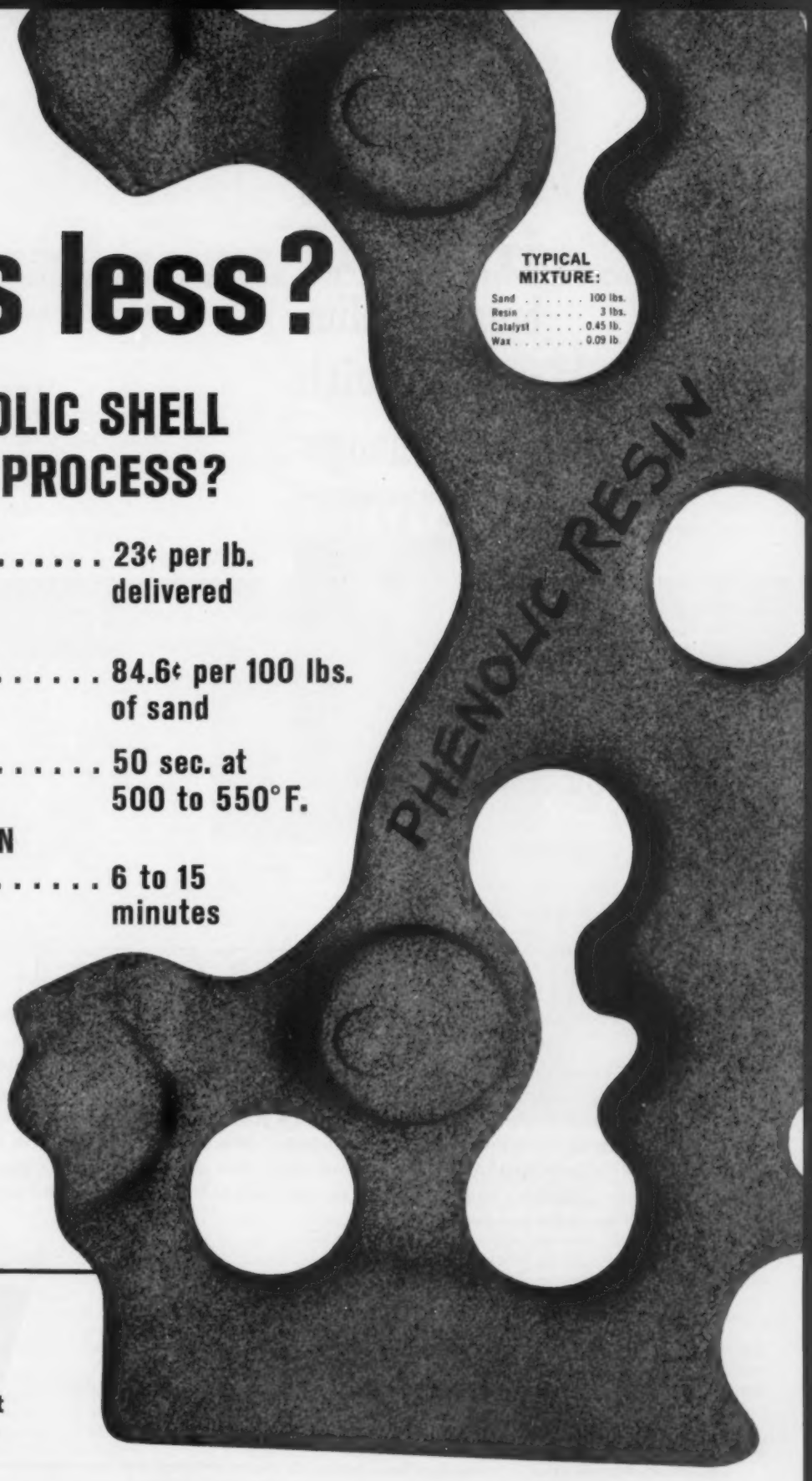
PHENOLIC SHELL CORE PROCESS?

COST OF RESIN . . . . . 23¢ per lb. delivered

COST OF TYPICAL MIXTURE . . . . . 84.6¢ per 100 lbs. of sand

CURE CYCLE . . . . . 50 sec. at 500 to 550°F.

SAND PREPARATION TIME . . . . . 6 to 15 minutes



Get more facts about CHEM-REZ "100" from your ADM MAN, or write for technical bulletin. A complete line of ADM resins, binders, clays, and facings is available for every foundry process.

FEDERAL FOUNDRY

SUPPLY DIVISION

2191 West 110th Street

Cleveland 2, Ohio

For More Information Circle 560, Page 39

Blast cleaning time cut in half breakage eliminated with spinner hanger cabinet

Castings which could not withstand tumbling action are blast cleaned quickly and safely in this versatile Wheelabrator Spinner Hanger Cabinet at Greenlee Bros. & Co.

A demonstration of WHEELABRATOR'S

VITAL VALUES

Although this Wheelabrator Spinner Hanger Cabinet has eliminated the problem of breakage of high tensile gray iron castings which were not suitable for batch mill cleaning, the big savings have come in reduced cleaning time. Blast times have been cut 50% by the efficient exposure of all surfaces to the blast of the two Wheelabrator units. With this versatile Wheelabrator, this foundry now cleans in 6 hours tonnage equal to their former 12-hour output. Abrasive and parts costs also are proportionately lower. Savings like these are vital to operating efficiency and profits—and are the heart of the values you get from Wheelabrator equipment and services. Write for complete information.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR® AIRLESS BLAST EQUIPMENT

WHEELABRATOR CORPORATION, 505 S. Byrkit St., Mishawaka, Indiana. In Canada, WHEELABRATOR CORPORATION OF CANADA, LTD. 1901 Birchmount Rd. P.O. Box 490, Scarborough, Ontario
A subsidiary of Bell Intercontinental Corp.

...Fluid Power news

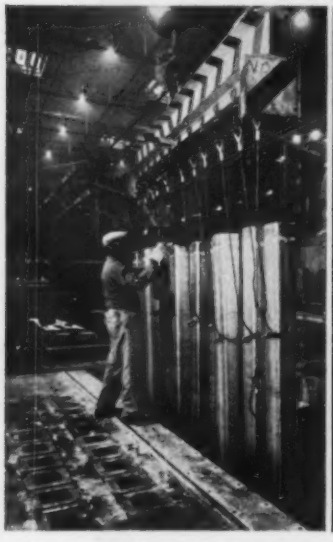
OILGEAR 40 Years of Fluid Power

From Oilgear *Application-Engineering* Files

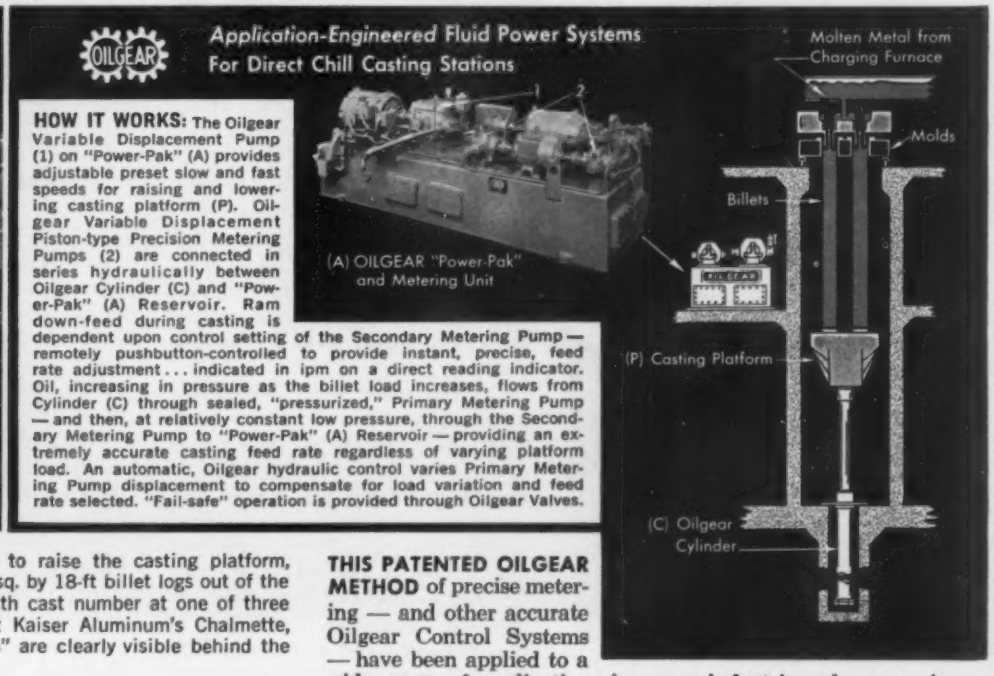
HOW OILGEAR SYSTEMS IN KAISER ALUMINUM PLANTS AID DIRECT CHILL BILLET CASTING PRODUCTION

USER: *Kaiser Aluminum & Chemical Corporation*

PROBLEM: To supply direct chill billet casting platform power and control systems for production of a major portion of the 1,050,000,000 lb of aluminum consumed annually by domestic extruders. Direct chill billet quality — avoidance of internal cracking, homogeneity, grain structure fineness and orientation — depends on a smooth, unvarying, precise platform feed rate, careful control of pouring speed and temperature, cooling rate, and other variables to prevent atmospheric oxidation and impurities. Up to 32 billet logs over 18 ft long are to be produced in a single cast. POWER AND CONTROL SYSTEM REQUIREMENTS: 1. Remote pushbutton control of all functions. 2. Rapid platform traverse up and down. 3. Infinite "down" feed rate selection — unvarying regardless of casting platform load increase; chatter-free — unaffected by off-balance platform loads. 4. "Fail-safe" — insuring completion of a cast in event of power failure. 5. Must be simple, and assure long, trouble-free, dependable service.



Above: Rapid traverse is used to raise the casting platform, bringing, in this case, the 6-in.-sq. by 18-ft billet logs out of the casting pit for identification with cast number at one of three direct chill casting stations at Kaiser Aluminum's Chalmette, La., Works. Direct chill "molds" are clearly visible behind the "marker."



HOW IT WORKS: The Oilgear Variable Displacement Pump (1) on "Power-Pak" (A) provides adjustable preset slow and fast speeds for raising and lowering casting platform (P). Oilgear Variable Displacement Piston-type Precision Metering Pumps (2) are connected in series hydraulically between Oilgear Cylinder (C) and "Power-Pak" (A) Reservoir. Ram down-feed during casting is dependent upon control setting of the Secondary Metering Pump — remotely pushbutton-controlled to provide instant, precise, feed rate adjustment ... indicated in ipm on a direct reading indicator. Oil, increasing in pressure as the billet load increases, flows from Cylinder (C) through sealed, "pressurized," Primary Metering Pump — and then, at relatively constant low pressure, through the Secondary Metering Pump to "Power-Pak" (A) Reservoir — providing an extremely accurate casting feed rate regardless of varying platform load. An automatic, Oilgear hydraulic control varies Primary Metering Pump displacement to compensate for load variation and feed rate selected. "Fail-safe" operation is provided through Oilgear Valves.

SOLUTION: Oilgear's patented Feed and Control System provides accurate volumetric metering of pressurized oil over a 200:1 pressure range, and a 100:1 feed range. Installations consist of an Oilgear Variable Displacement Pump direct-connected to an electric drive motor, two Oilgear Precision Variable Displacement Metering Pumps direct-connected to a double-end synchronous electric motor — all mounted on a custom-built reservoir base (A); and Oilgear piston- and ram-guided, chatter-free, *Custom-Quality* Cylinder (C); Oilgear Valves and Controls ... all thoroughly, carefully *Application-Engineered.*

USER REPORTS — "Where accumulating load on the platform varied oil pressure from 50 to 1500 psi, and the rate of metering was preset anywhere from 50 to max. cipm, *there was no measurable change on the preset rate of casting feed during any portion of the stroke.*"

There has been NO major maintenance on these heavy-duty Oilgear Systems operating continuously in Kaiser Aluminum plants across the nation — some for over 7 years — and still "going strong."

THIS PATENTED OILGEAR METHOD of precise metering — and other accurate Oilgear Control Systems — have been applied to a wide range of applications in many industries where varying loads must not affect the speed of linear movement or hydraulic motor rotation. Carefully Application-Engineered Oilgear Systems — also used extensively on extrusion presses ... aluminum foil laminating machines ... stretching, forming, drawing and spinning presses ... can-closing and filling machines ... metal briquetting presses ... ladle tilting, ingot manipulators, strippers, and scalpers — have all proved Oilgear equipment's traditionally long life, prompting users to state —

"for the lowest cost per year ... it's Oilgear!"

For similar practical solutions to YOUR linear or rotary motion problems, call the factory-trained Oilgear Application-Engineer in your vicinity. Or write, stating your specific requirements directly to ...

THE OILGEAR COMPANY

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Plants: Hammond, Indiana
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Prompt repairs on alloy slings in both plants.

Taylor Made CHAIN SINCE 1873

For More Information Circle 562, Page 39

With the EDITORS

CONVENTION IMPRESSIONS: Another convention has been added to the long list conducted by the American Foundrymen's Society, and of course, many impressions remain. Editor Bill Gude has presented a number on Page 61, and I would like to add a few to the list.

The dramatic space flight of Comdr. Alan B. Shepard Jr. on May 5, and the hero's welcome in Washington on the following Monday recalls other great events during past conventions, such as the burning of the Zeppelin Hindenburg during the Milwaukee show in 1937 and the German invasion of the Low Countries during the Chicago show in 1940.

Attendance at San Francisco was somewhat disappointing. Distance and the economic situation of recent months undoubtedly were partly responsible.

Vendors of equipment, supplies, and services, as in the past, provided substantial support to the registration total. In fact, some effort should be made to get the long corridor-lobby at San Francisco's Sheraton-Palace Hotel named Vendors' Alley.

On the other hand, attendance at the banquet was exceptional, utilizing the capacity of the Palace's beautiful Garden Court, and exceeded attendance a year ago. Entertainment by the Californians (of which Clayton Russell, Phoenix Iron Works, is a member), the Bay Town Four and the Jazzabelles was splendid. Interest at the banquet at San Francisco and at Atlantic City in 1952, both of which substituted entertainment for speakers, might suggest the way to attract greater attendance to future banquets.

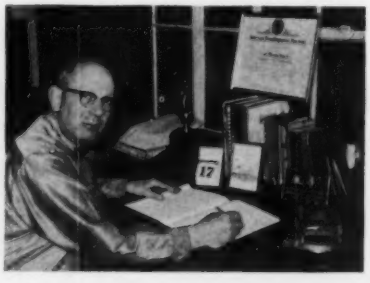
Number of papers for presentation at the technical sessions seems to grow. Can it be that the society is reaching the limit in the number of papers which can be presented to best advantage at a five-day session and still leave time for discussion?

San Francisco, with its wealth of points of interest and fine eating establishments was a great joy for many convention visitors. No other city seems to offer so much.

And finally, Detroit with the International Congress and show, May 7 to 11, 1962, was in evidence at the Golden Gate.

50 Years: One of the old timers greeting friends at the San Francisco convention was Earl M. Strick, finishing superintendent, Erie Malleable Iron Co., Erie, Pa.

Earl reported that on April 17 he celebrated his birthday and 50 years with the foundry industry,



of which 46 were with Erie Malleable. The accompanying illustration, taken that day, shows Earl at his desk. The center photo on the desk shows the Erie Malleable Iron Co. in 1880, the year it poured its first iron. Am glad to report that FOUNDRY also has a prominent place on Earl's desk.

Earl has been active in serving the foundry industry on a local and national basis. He was co-organizer of the Northwestern Pennsylvania Chapter of AFS and served as its second chairman. He also served the chapter as secretary, treasurer, and for many years as educational chairman. He was national chairman of the AFS Youth Encouragement Committee and was producer of the film strip "A Career in Metals." He has appeared as a speaker before many groups, and has prepared articles for FOUNDRY and other publications. At Cleveland in 1954 he was awarded an honorary life membership in AFS.

Congratulations, Earl, on your exceptional service to your company and the foundry industry in general.

Made of Gray Iron: Recently John E. McIntyre, Sibley Machine

Cut metal cleaning costs with blasting

Pressure blasting with Norton ARROW-BLAST abrasive will save money every step of the way on most of your metal cleaning jobs — because of the high cutting efficiency and longer life of ARROW-BLAST grain. Composed of fused alumina grains that are tough, hard and sharp, ARROW-BLAST abrasive has high resistance to breakdown so that it can be used repeatedly through several cleaning operations. And unlike sandblasting, dust is negligible with ARROW-BLAST abrasive eliminating poor visibility and other hazards.

Norton NORBIDE* pressure blast nozzles add even more to the savings picture. Molded of boron carbide, the man-made material that's next to diamond in hardness, these nozzles have proven over and over that they have much lower overall operating cost than so-called "inexpensive" nozzles. NORBIDE nozzles cut costs right down the line — in replacement . . . operator downtime . . . air consumption.

An informative new report from Norton entitled "Pressure Blasting with Manufactured Abrasives," gives many details and operating facts about this efficient and economical metal cleaning process. For your copy, write NORTON COMPANY, General Offices, Worcester 6, Mass.

*Trade Marks Reg. U.S. Pat. Off. and Foreign Countries

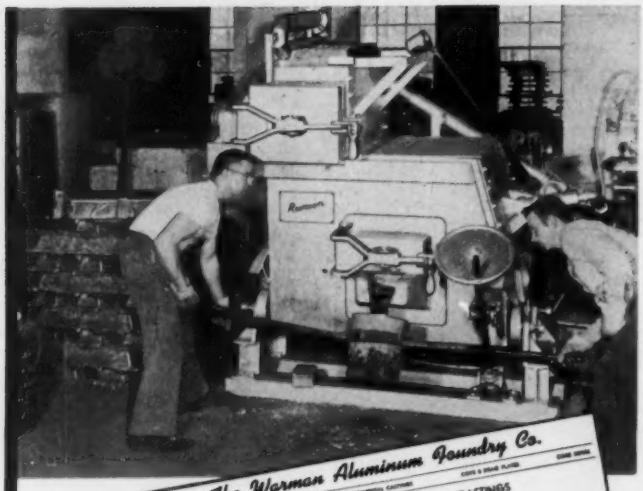
NORTON
ABRASIVES

G-411

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Non-Slip Floors — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

For More Information Circle 563, Page 39



The Warman Aluminum Foundry Co.

ALUMINUM CASTINGS -:- ALUMAL CASTINGS

5618 Center Hill Ave.
Cincinnati 16, Ohio

December 30, 1959

Mr. Rex Harrison
International Foundry Supply
Reading, Penna.

Dear Sir:

I am writing this letter in regards to our conversation a few months ago at which time I promised to send you a statement of my opinion of the Revcon.

I am not in the habit of making snap judgments of people or machinery, therefore I have put the furnace to good use before writing.

The Revcon is everything you said it would be in speed, and above all in quality and quantity. It is possible to get quality metal from the Revcon that I never dreamed could come from a gas fired furnace and at any temperature desired from 1250 degrees F. to 1500 F.

The baffle improved the melt in both speed and gas consumption. Our gas bill is on its way down as we use the Revcon more. We also have decreased our melting loss by using this reverbatory furnace properly.

The more I use the Revcon the harder it is for me to understand how I ever got along without it for the past ten years. It makes crucible melting as old-fashioned as the horse and buggy. I now use one Revcon where I once used three crucible furnaces and get better metal faster.

I can end this rather lengthy [illegible] by saying, if there is a foundry that does not have a Revcon, they do not know what they are missing and should look into the subject as soon as possible.

Sincerely yours,

THE WARMAN ALUMINUM FOUNDRY CO.

Chester Brickler
Foundry Foreman

CB:mlb

REVECON FURNACES — TECHNICAL REPORT — No. 111 6

Firm: THE WARMAN ALUMINUM FOUNDRY COMPANY Cincinnati, Ohio

Visited by: Rex Harrison — Date: Oct 1, 1959 — Contact Mr.: C.B Brickler

Furnace No. 6 59081007 — Type 320/500 — Fuel Natural Gas — General Condition: Good

Approximate Life of Lining or Time of Tests: 2 weeks 55 hrs.

Condition of Lining: — Good

Preheat 30 minutes

REPORT ON MELTING TESTS — Date: Sept 25, and Oct 1, 1959

No.	METAL Form	Spec.	TIME Charged	Ready	Poured	FUEL CU. FT. Start	End	Amount	CHARGED Lbs.	POURED Lbs.	LOSS Lbs.	% LOSS	Temp. Pour. Pour Temp. etc.
Sept 25	Ingot	356	1:39	1:55	2:25			400	285.00	280.15	2.85	1.0	1250° F
									Thermal Test	Thermal Results			
Oct 1	Ingot	108	8:15	8:35	8:45				300	Good			1350° F
	&	"	8:57	9:15	9:20				300	Good			1300° F
	Returns	"	9:27	9:40	9:45				300	Good			1320° F

Cost to melt:

Melting loss	1% @ $24.00/100 lbs	$ .2640/100 pounds
Fuel	141 CF @ 1.60/1000 CF	.1128 " "
Flux	5 lb @ $.72/lb	.1109 " "
Refractories	$24.00 for 600,000 lbs	.1046 " "
Total		$ .5923 " "

DOES NOT INCLUDE LABOR OR POWER — $ .0056

These tests were as called and in great favor with our practice

Witnessed by: C. B. Brickler, Foundry Foreman

PROOF OF REVECON Aluminum Melting Superiority

LET US SHOW YOU HOW to enjoy benefits like these in your Foundry! Non-crucible REVECON Furnaces are available in sizes for every foundry need: 50 lb. to 12,000 lb. capacity. REVECON offers the greatest possible flexibility when changing metals. Oil, gas or coke fired.

WRITE TODAY requesting our informative 20-page Brochure!

INTERNATIONAL FOUNDRY SUPPLY CO.

P. O. Box 1053, Reading, Pa. (FR 6-0794)

Canadian Representative: DREW BROWN LTD., 5410 Ferrier St., Montreal 9

Co., South Bend, Ind., and president, Gray Iron Founders' Society, attached a sticker to his car bumper, and one phase of the gray iron promotion program was off (years ago before good roads, it would be in

a cloud of dust). Single stickers are available free from Gray Iron Founders' Society, National City-E. Sixth Bldg., Cleveland 14, Ohio.

Historic Relic: Glenn H. Cox of Eldrige Inc., an advertising agency at 38 West State St., Trenton, N. J., has sent a clipping from the Trenton *Evening Times* of March 22, telling of an 11th-hour movement to spare the historic Fisher-Morris Anvil Works, Bloomsbury St., Trenton, from demolition to make way for a 14-story State Labor Department building which is scheduled to get under way this summer.

Several comments in the story interested me particularly. One indicates the growing disregard of the historic, the beautiful, or the rights of the individual, as follows:

"Although the city commissioners realized long ago the building's value as an architectural and historic relic, they have considered its destruction as part of the price of progress and have never seriously discussed trying to save it."

The other comment in this article was made by Mrs. Gertrude S. Bodone of the Trenton Housing Association as follows:

"The great dignity of its architecture with its round arched Georgian windows and doors in the massive beautifully laid up stone work makes it a remarkable early structure."

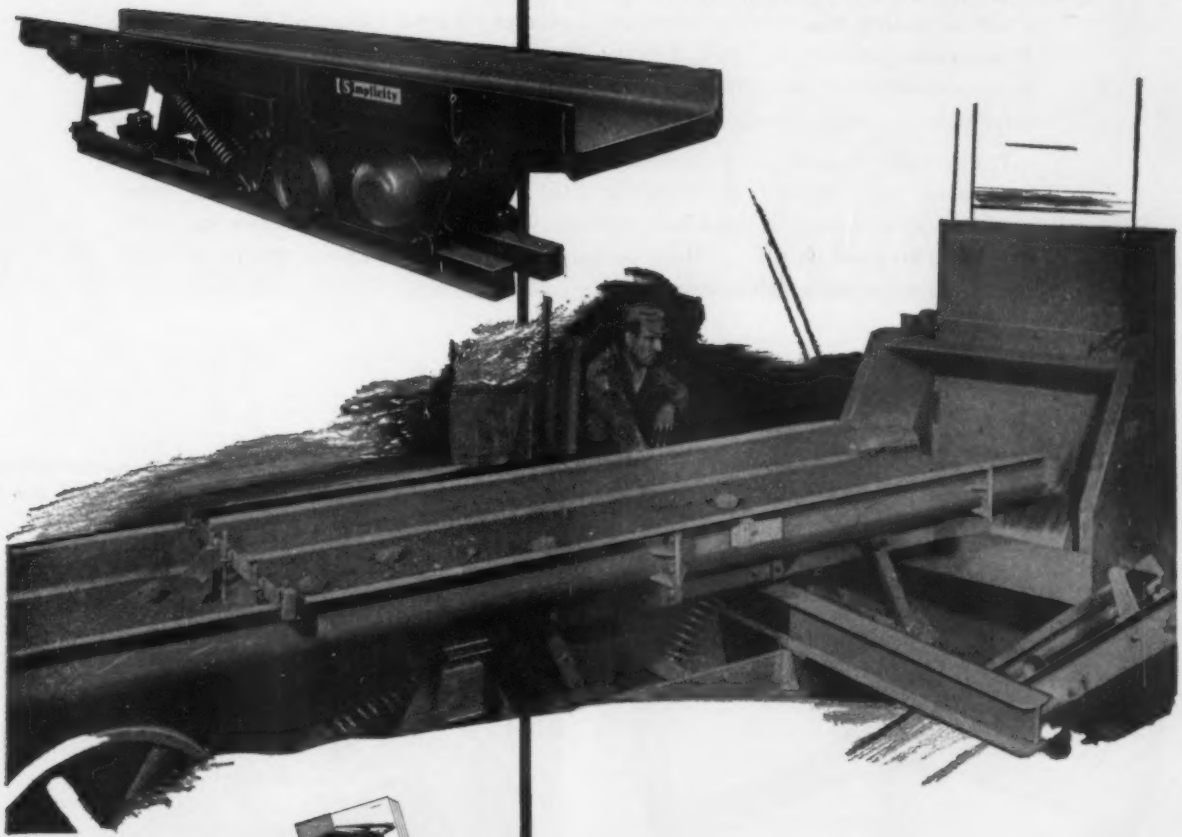
The article points out that the structure has been occupied by the Fisher-Morris Anvil Works since 1843 when the first anvil cast in America was produced there. Records show that the first Dahlgren gun used in the Civil War was cast there. F.G.S.

An Eastern Foundry Conveys and Cools 120 Tons per Hour of Sand with Simplicity "VS" Conveyor

The Simplicity model "VS" conveyor shown moves hot sand from two shakeouts, up a three degree incline, to an elevator at an average rate of 80 tons, with a peak load of one hundred twenty tons per hour. As the sand moves along the conveyor deck, water is added and plows turn the sand thus reducing the sand temperature one hundred degrees. The sand is discharged from the conveyor into the elevator boot over a permanent magnet which removes all of the metal particles.

Simplicity conveyors have proved efficient for transferring materials such as sand and castings, from one point to another. Feed points can be positioned along the length of the conveyor, and materials transferred to a common discharge point.

"VS" conveyors are available in widths from 12" to 36" and in lengths from 10' to 60' with one drive assembly. At customer request, these conveyors can be equipped with liners, covers, or can be built in two surface units.



Write for catalog C-1 which describes the various models of Simplicity Conveyors.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 7, MICHIGAN

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario.
FOR EXPORT: Brown & Sites, 50 Church Street, New York 7, N. Y.

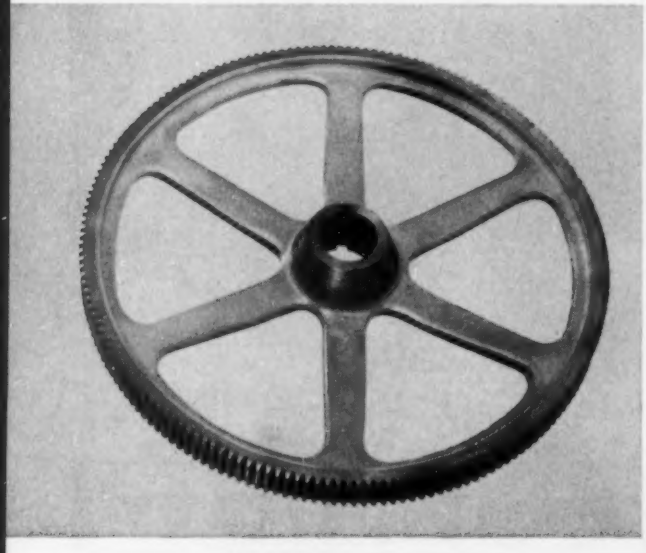
224

Republic Malleable Pig Iron Helps Loom Maker Weave Pattern of Success

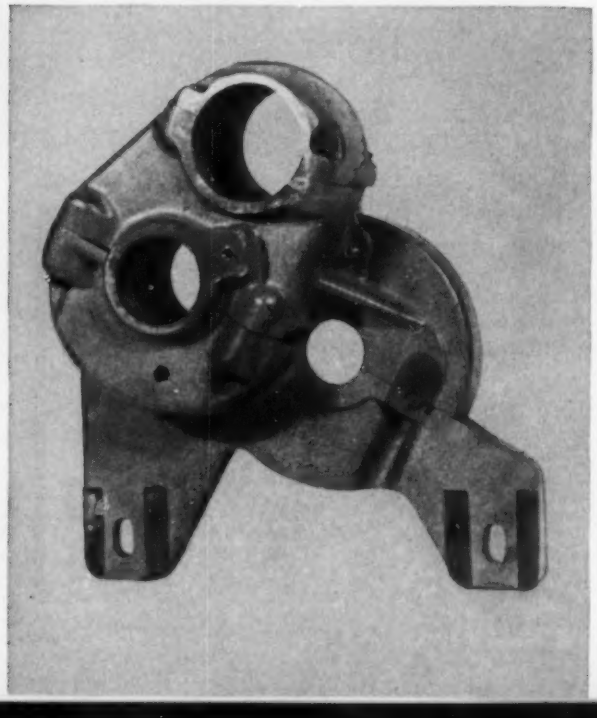
When Draper Corporation's popular, new shuttleless loom goes into action, cast parts operate in precise relationship to each other with the accuracy of a fine watch. Loom design must provide both strength and extreme accuracy.

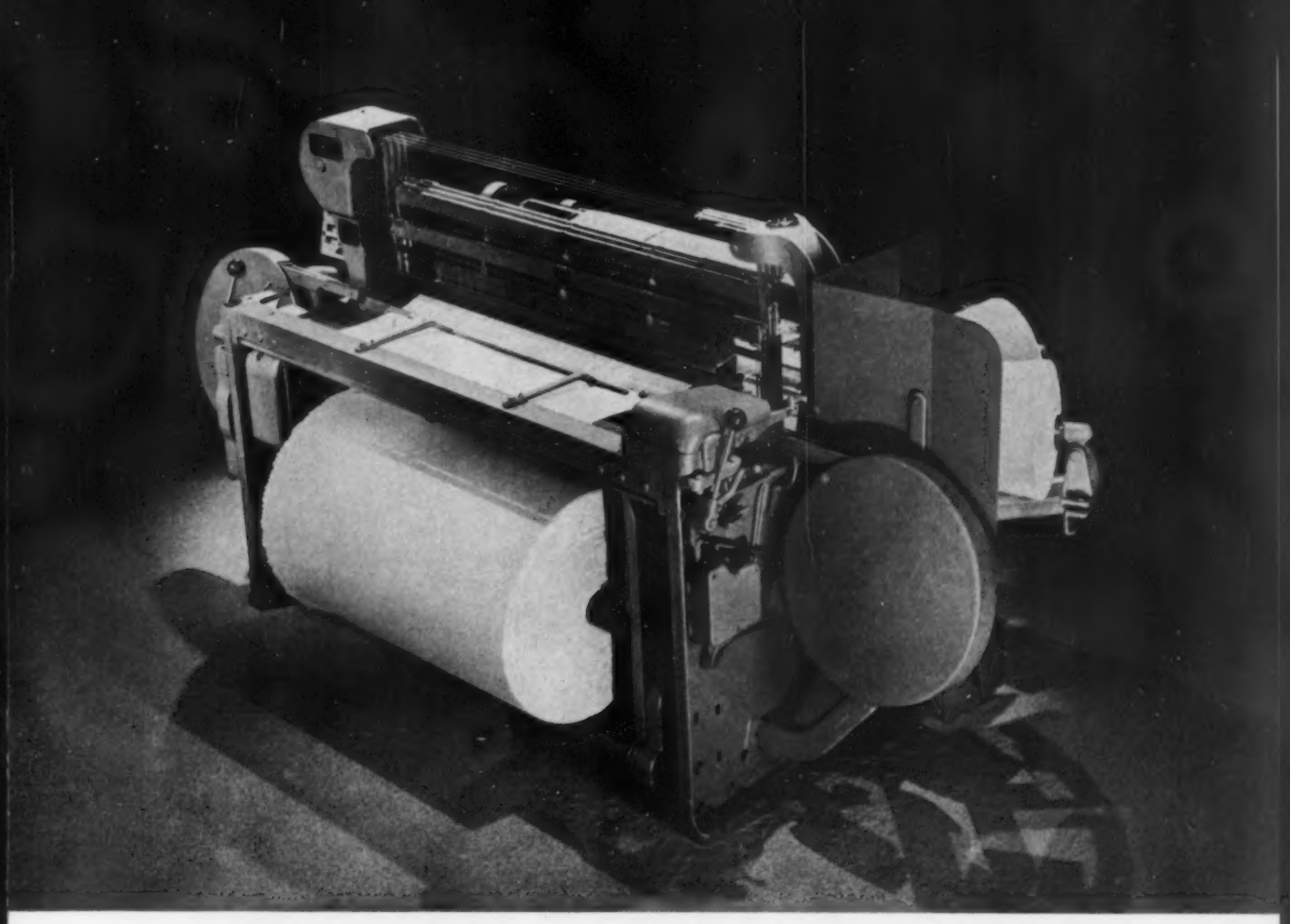
For these reasons, Draper uses only the highest quality raw materials, including Republic Malleable Pig Iron, in casting precision loom parts. And, to maintain absolute quality control, the company operates its own foundries at Hopedale, Mass. and Spartanburg, S. C. They have found that Republic Malleable Pig Iron provides the strength and machinability required for the production of extremely accurate castings.

Draper, like thousands of other customers, relies on the uniform chemistry and consistent high quality of Republic Pig Iron to produce strong, flaw-free, economical and easy-to-machine castings. Consider these advantages in terms of your own production . . . then contact your Republic representative, or mail the coupon for more information.



Transmitter gear and harness change gear case are two of many precision castings produced from Republic Malleable Pig Iron by Draper Corporation for the shuttleless loom.





COMPLETE FOUNDRY ENGINEERING SERVICE is available without obligation to all foundries. Republic Foundry Service Engineers are thoroughly qualified to assist you in every department of your foundry operation. They recommend, from industry's most complete line of merchant pig iron, the grade best suited to your requirement, your equipment, your specification. Northern grades include Chateaugay, Foundry, Malleable, Bessemer, and Basic. Southern furnaces produce Malleable, Foundry, and Basic.

For ideas on increasing the use and sale of castings . . . for suggestions on increasing production efficiency . . . for information on the latest foundry processes and techniques, mail the coupon for a call by a Republic Foundry Service Engineer.

For More Information Circle 566, Page 39

REPUBLIC STEEL

Cleveland 1, Ohio

Producer of Industry's Most Complete Line of Merchant Pig Iron

REPUBLIC STEEL CORPORATION
DEPT. FO- 1915-R
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

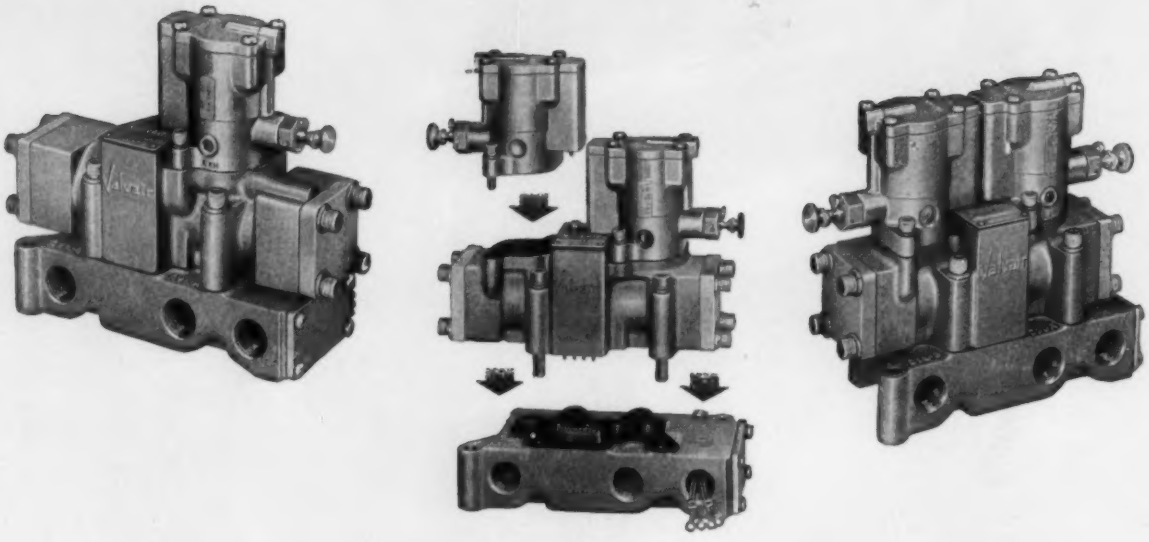
☐ Have a Foundry Service Engineer call.
☐ Send more information on Republic Pig Irons.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____



4-way single or double pilot-operated types, for sub-base or manifold mounting. Aluminum and stainless steel components assure multi-million cycle dependability. Interchangeable pilots, with coils guaranteed against burn-out for life of valve, fit any plug-in Speed King. Coils for AC or DC, most voltages . . . 35—200 psi range . . . integral junction box . . . optional manual over-ride, sub-base connected external pilot supply . . . ¾ in. separate exhaust ports, ½ or ¾ in. inlet and cylinder ports.

VALVAIR® 1/2 in. NPT PLUG-IN VALVES

Based on the service-proved design principle of Speed King ¼ in. plug-ins, Valvair's ½-¾ in. plug-in valve series provides plug-in convenience and versatility to a wider range of control valve applications.

Electrical and pneumatic circuits are completed automatically when valve and pilot are plugged in . . . bolted down. The result—cost-cutting reduction of original installation and maintenance time. All power connections are made permanently in sub-base or manifold . . . there's no need to disturb piping or wiring for quick in-service maintenance.

What's more, advanced design shortens stroke . . . speeds response. Separate coded (4-wire) circuits on double solenoid models meet JIC requirements. Flow area through valve and sub-base equals or exceeds that of full ½ in. pipe.

Whether your control valve applications are on the drawing board or now in service, it'll pay you to investigate the advantages of Valvair plug-in design. A call to your nearby Bellows-Valvair field office will bring prompt application engineering recommendations.

For more information, write for Bulletins SPL and DPL. Address Bellows-Valvair, Akron 9, Ohio, Dept. FO-661.

Bellows-Valvair
AKRON 9, OHIO
DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

8170

LATE NEWS

THE RISING TIDE: There no longer is any question that the recession hit bottom by the end of February and that it was most severe in the durable goods industries in general and probably in metalworking in particular. As of this writing, the resurgence has begun, although it still is mild. Economists now are turning their attention to the matter of how fast and how far it will go.

So far, the automotive and steel industries seem to be leading the way, with construction showing signs of joining the parade. Personal income has been on the upgrade, too, and electric power usage has not shown the customary seasonal decline.

CASTINGS PRODUCTION: As reported here last month, production of castings is reflecting the over-all business improvement. During January and February, shipments totaled only about two-thirds of shipments during the same months in 1960, but March saw the first upturn in months. So far it hasn't been spectacular, but it apparently is real, and the Gray Iron Founders' Society reports expectation of further gains for gray iron foundrymen in April and May. One of the most encouraging signs is a surge of new work reported by pattern shops. Once the new patterns get into foundries, the outlook should brighten sharply.

DIECASTINGS OFF: Both aluminum and zinc diecasting production showed small drops during 1960, with aluminum off 2.6 per cent from 1959 and zinc off 4 per cent. The American Die Casting Institute attributes the decline to

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1959	58,979,881	9,613,059	1,156,097	9,232,037
1960				
Feb.	6,478,564	822,476	97,688	1,013,388
2 mo.	13,506,176	1,645,918	193,130	2,071,547
Mar.	6,655,569	839,016	106,749	974,535
Apr.	5,625,717	754,486	82,767	787,186
May	5,051,121	771,809	79,170	652,585
June	4,485,444	809,297	87,485	633,797
July	3,678,127	603,062	55,974	520,361
Aug.	4,217,562	692,470	78,788	697,243
Sept.	4,148,550	732,252	76,939	641,712
Oct.	4,375,871	742,039	71,862	675,356
Nov.	3,939,970	709,187	70,282	607,471
Dec.	3,738,385	569,250	66,438	601,274
Total	59,422,492	8,968,777	959,584	8,853,067
1961				
Jan.	4,059,361	654,353	65,434	646,999
Feb.	3,925,802	593,810	61,286	642,853
2 mo.	7,985,163	1,248,163	126,720	1,289,852

Index of Foundry Equipment Orders

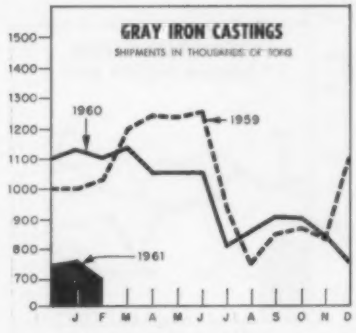
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1960	1961
Jan.	95.5	123.7
Feb.	128.6	81.8
Mar.	159.9	99.1
Apr.	97.9	....
May	159.0	....
June	164.8	....
July	80.0	....
Aug.	92.4	....
Sept.	158.1	....
Oct.	81.7	....
Nov.	106.5	....
Dec.	101.2	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings — Total	All Castings — For Sale	Miscellaneous Total	Castings For Sale Total	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3]
1959	12,307,798	6,994,200	7,451,925	3,247,289	173,433	2,142,498	309,945	1,440,883	862,547	.....
1960										
Feb.	1,107,909	571,329	679,115	279,376	16,430	284,738	17,848	76,332	49,876	855,324
2 mo.	2,243,715	1,163,363	1,356,738	556,706	33,435	580,732	36,311	163,130	106,804	.....
Mar.	1,143,665	600,448	685,392	284,493	15,670	294,322	24,409	83,121	56,441	830,132
Apr.	1,051,700	580,931	609,577	259,335	13,980	232,895	21,737	118,856	68,605	824,495
May	1,052,798	588,770	613,745	257,180	13,126	207,094	20,414	136,455	75,090	781,596
June	1,049,638	601,597	622,236	273,148	15,010	183,049	19,810	144,773	79,779	719,564
July	803,306	456,580	478,269	202,347	10,894	120,784	16,226	120,652	67,375	784,789
Aug.	858,503	548,393	490,059	238,561	15,675	131,428	14,221	139,275	83,520	712,784
Sept.	900,497	527,227	554,788	245,887	14,616	125,658	13,460	135,327	71,224	695,325
Oct.	905,139	509,654	568,869	238,249	12,859	139,977	12,559	117,009	66,725	646,852
Nov.	835,709	454,611	538,817	230,022	11,870	123,054	12,410	102,959	58,469	648,974
Dec.	748,821	394,981	506,979	219,525	12,097	107,559	12,306	73,959	48,018	552,813
Totals	11,593,511	6,402,957	7,025,469	3,005,453	169,853[4]	2,246,582	203,863	1,335,546	782,051	.....
1961										
Jan.	769,136	406,315	504,182	222,508	11,874	123,277	11,847	69,881	50,949	599,776
Feb.	702,413	378,252	465,654	209,207	11,184	116,563	7,403	66,541	46,252	629,623
2 mo.	1,462,549	784,567	969,836	431,715	23,058	239,840	19,250	136,422	97,201	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. [1]Source: Bureau of the Census. [2]For sale only. [3]All cast iron pipe is shipped for sale. [4]Gray iron total includes nodular iron. [5]Monthly figures do not add up to total shown because of unreported monthly revisions.

Late News

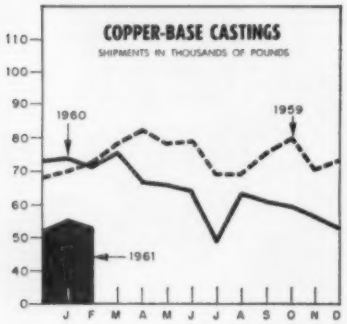
the trend to compact cars as well as to the general condition of the economy. The ADCI states that "Although new applications were developed for the 1960 cars and 1.1 million more cars were produced last year than in 1959, the trend to compacts drastically lowered the average use of diecastings per car." The aluminum decline came even in the face of the introduction of diecast aluminum blocks on some models of Chrysler and American Motors cars.

DETROIT IN '62: With the 1961 San Francisco Castings Congress over, AFS already is at work on the 1962 Congress and Exposition, scheduled for May 7-11 in Detroit's new Cobo Hall, in conjunction with the 29th International Foundry Congress. The society expects a worldwide attendance of 16,000 or more, or about ten times the disappointing San Francisco total. An unusual feature of the 1962 show will be the red carpet treatment scheduled for visitors: Almost 1000 ft of red carpet 12 ft wide will cover the main diagonal aisles of the show.

IMPROVED SCRAP: Technological improvements in the processing of ferrous scrap are certain to benefit foundries, according to William S. Story, executive vice president, Institute of Scrap Iron & Steel, Washington. He says a new technique for upgrading takes miscellaneous scrap and puts it through a cleaning and tearing process which produces small pieces of scrap with excellent melting characteristics.

PERSONALS: John K. Foster has been elected executive vice president, Shenango Furnace Co., Pittsburgh . . . Mark M. Miller has joined Texas Foundries Inc., Lufkin, Tex., as general sales manager. He formerly was vice president-sales, National Malleable & Steel Castings Co., Cleveland . . . Lester G. White has joined Monarch Alloys Co., division of A. C. Williams Co., Ravenna, Ohio, as director of the company's newly instituted research and development center . . . Ralph W. Ferguson has been appointed district manager for the Newaygo Engineering Co., Newaygo, Mich., in the midwest region . . . Frank A. Speer

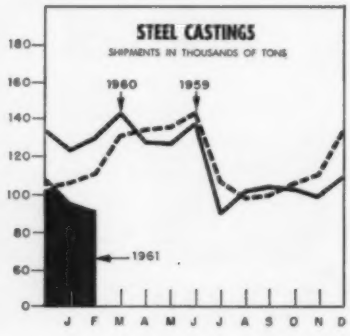
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1959	871,032	765,246	52,456	.....
1960				
Feb.	71,797	63,103	4,146	26,970
2 mo.	145,768	128,845	8,061	.....
Mar.	75,908	66,517	4,346	27,470
Apr.	66,777	58,453	4,523	27,423
May	66,299	57,848	4,463	24,582
June	64,585	56,441	3,715	21,781
July	48,399	42,778	2,910	22,367
Aug.	63,765	56,344	3,669	21,915
Sept.	61,362	54,104	3,699	21,063
Oct.	59,877	52,734	3,556	22,008
Nov.	56,358	50,043	3,132	21,261
Dec.	53,009	46,237	3,369	21,914
Total	762,107	670,344	45,443	.....
1961				
Jan.	55,878	48,928	3,286	22,792
Feb.	53,457	47,156	2,615	22,065
2 mo.	109,335	96,084	5,901	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1959	1,412,885	1,112,668	210,984	1,043,538	814,219	194,201	369,347	308,449	16,783	.....
1960										
Feb.	129,259	97,927	23,530	96,888	72,963	22,326	32,371	24,964	1,204	279,684
2 mo.	251,824	191,979	42,564	190,085	143,778	40,235	61,739	48,201	2,329	.....
Mar.	143,706	109,688	25,702	104,742	78,755	24,266	38,966	30,933	1,436	277,982
Apr.	127,219	96,577	22,828	93,433	70,251	21,253	33,786	26,306	1,575	248,902
May	126,580	97,231	23,890	93,700	71,808	22,421	32,880	25,423	1,469	252,293
June	136,922	107,076	26,389	101,294	78,601	24,707	35,698	28,475	1,682	233,765
July	89,565	67,294	13,430	63,753	47,570	12,804	25,812	19,724	626	223,880
Aug.	101,709	77,146	14,619	73,338	55,099	13,713	28,371	22,047	906	213,611
Sept.	104,298	79,556	14,171	74,447	56,126	13,273	29,851	23,430	898	199,413
Oct.	102,664	79,622	14,586	72,544	57,879	13,544	30,120	21,743	1,042	186,311
Nov.	99,577	78,305	15,768	69,927	56,466	14,113	29,650	21,839	1,655	174,317
Dec.	108,249	87,417	24,849	78,805	64,997	22,295	29,444	22,420	2,554	162,882
Total	1,392,335	1,071,871	238,796	1,016,065	781,330	222,624	376,317	290,541	16,172	.....
1961										
Jan.	96,190	76,650	11,534	68,795	56,592	10,550	27,395	20,058	984	156,683
Feb.	92,602	71,907	9,128	64,849	51,209	7,813	27,753	20,698	1,310	145,024
2 mo.	188,792	148,557	20,662	133,644	107,801	18,368	55,148	40,756	2,294	.....

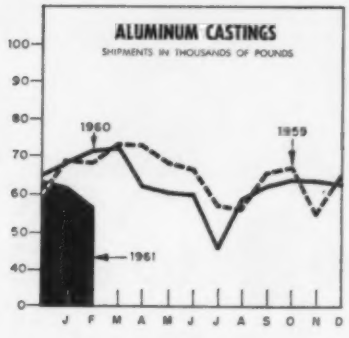
[1]Source: Bureau of the Census. [2]For sale only.

has been named vice president and works manager, Mueller Co., Decatur, Ill. He will direct manufacturing operations for all Mueller Co. domestic facilities . . . Charles Yaker has been appointed vice president in charge of manufacturing for the Whitehall and Muskegon, Mich., plants of Misco Precision Casting Co., Whitehall, a division of Howe Sound Co. Ajax Vartanian has been appointed manager of the Muskegon plant . . . Roland G. Becker has been named assistant sales manager, Bay State Abrasive Products Co., Westboro, Mass. . . . Roger J. Brown has been appointed district manager in Buffalo for Frederic B. Stevens Inc.

OBITUARY: Frank T. Hamilton, 63, president, Rudisill Foundry, Anniston, Ala., died May 16 . . . Winfred B. Morgan, 55, secretary-treasurer, Ruston Foundry & Machine Shops Ltd., Alexandria, La., died May 16.

ARKANSAS FOUNDRY: Midwest Casting Corp. has begun operations in a new $760,000 plant at Little Rock, Ark., and will cast gray iron, aluminum, and brass. The foundry contains about 50,000 sq ft of floor space, plus a pattern shop and an office. Capacity is 20 to 25 tons daily. Officers include Vernon J. Giss, president; Ernest T. Hays, vice president; and Raymond H. Thornton Jr., secretary-treasurer.

MISCELLANY: General Steel Castings Corp., Granite City, Ill., has changed its name to General Steel Industries Inc. . . . American Smelting & Refining Co., New York, has reduced its zinc alloy diecasting prices by $10 a ton, or ½ cent per pound . . . American Steel Foundries has reopened its Granite City, Ill., and Alliance, Ohio, plants, which were closed during April. Both produce cast steel components for freight cars . . . Wellman Bronze & Aluminum Co. has completed the move of its plant facilities from Cleveland to the former Dow Metal Products Co. magnesium and aluminum casting plant in Bay City, Mich. . . . Orders for new freight cars in April totaled 2040 as compared with 1796 for March . . . Sales of material handling equipment in March showed a rise of 19.7 per cent over February . . . Sivyer Steel Casting Co., Milwaukee, has acquired Riverside Foundry, Bettendorf, Iowa.



PRODUCTION WORKERS

Estimated Number

	Feb. 1961	Jan. 1961	Feb. 1960
Ferrous	203,200	206,800	232,200
Nonferrous	55,700	57,300	67,000

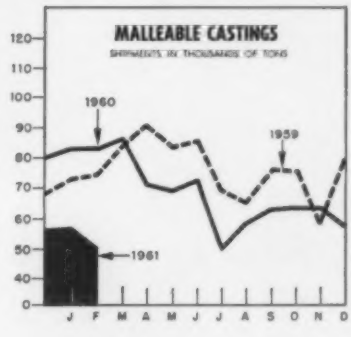
Average Weekly Earnings

Gray Iron	90.77	89.79	99.20
Malleable Iron	91.26	92.13	96.47
Steel	101.78	99.53	100.88
Nonferrous	103.17	101.89	101.00

Average Weekly Hours

Gray Iron	36.9	36.5	40.0
Malleable Iron	36.8	37.0	39.7
Steel	38.7	37.1	39.1
Nonferrous	40.3	39.8	40.4

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[1]
	Total	Sand	Perm. Mold	Die	
1959	786,399	141,987	274,855	368,101	.....
1960					
Feb.	71,699	11,800	23,614	36,177	83,914
2 mo.	139,946	23,078	45,962	70,691	.....
Mar.	72,216	12,934	22,413	36,749	78,024
Apr.	61,797	12,339	19,950	29,400	75,243
May	60,330	10,682	21,507	28,055	75,977
June	60,068	11,280	29,953	27,722	74,699
July	45,694	8,765	15,804	20,973	76,434
Aug.	58,848	10,639	18,901	29,256	75,230
Sept.	62,116	10,514	22,031	29,527	75,144
Oct.	63,750	10,149	23,339	30,213	71,364
Nov.	63,408	9,901	23,612	29,831	73,032
Dec.	63,629	9,578	23,272	30,677	71,398
Total	751,802	129,859	257,764	363,094	.....
1961					
Jan.	60,774	10,210	21,821	29,904	63,729
Feb.	57,144	10,183	19,518	27,355	62,748
2 mo.	117,918	20,393	41,339	57,259	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1959	916,363	557,303	729,868	449,946	186,494	107,357	.....
1960							
Feb.	83,118	46,850	64,131	37,391	18,987	9,450	98,272
2 mo.	166,306	93,094	127,768	73,324	38,538	19,680	.....
Mar.	86,243	49,907	67,448	40,422	18,795	9,485	84,679
Apr.	71,271	39,059	56,136	32,066	15,135	6,993	79,237
May	68,942	37,618	53,108	30,126	15,834	7,492	73,240
June	72,593	43,105	55,956	34,526	16,637	8,579	63,920
July	49,860	28,575	37,187	22,477	12,673	6,098	74,329
Aug.	58,785	36,765	46,522	29,077	12,263	7,688	69,853
Sept.	63,048	36,114	48,635	28,623	14,413	7,491	69,033
Oct.	63,521	35,492	47,932	27,813	15,589	7,679	56,616
Nov.	62,978	35,432	47,571	27,611	15,407	7,821	55,627
Dec.	57,154	31,500	43,319	24,729	13,835	6,771	54,657
Totals	820,701	466,571	631,582	370,794	189,119	95,777	.....
1961							
Jan.	57,697	34,064	43,778	27,104	13,919	6,960	52,171
Feb.	50,828	29,675	39,358	23,854	11,470	5,821	47,703
2 mo.	108,525	63,739	83,136	50,958	25,389	12,781	.....

Prices of Foundry Metals and Coke

(As of May 29, 1961)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-$18.50

OVENS

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Boston, deld.	77.79	78.29
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 32.00; tin bronze, No. 225, 41.25; No. 245, 35.75; high-leaded tin bronze, No. 305, 36.00; No. 1 yellow, No. 405, 27.50; manganese bronze, No. 421, 31.50.

ALUMINUM: Primary alloy No. 13, 25.90; No. 43, 26.20; No. 195, 27.60; No. 214, 29.00; No. 356, 26.80. Secondary No. 12 alloy, 21.75-22.25. Deoxidizing grades: No. 1, 23.25; No. 4, 20.00.

MAGNESIUM ALLOY: AZ91A, 40.75; AZ63A, AZ92A, AZ91C, 40.75, f.o.b. Velasco, Tex.

COPPER: Electrolytic 31.00, delivered Connecticut valley.

ZINC: High grade, 12.35, delivered. Die casting alloy No. 3, 13.75; No. 2, 14.25, delivered.

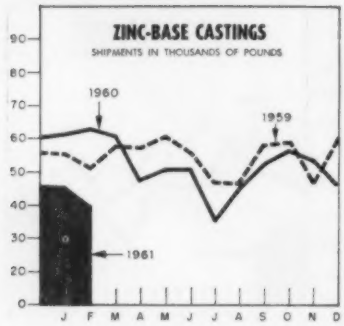
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Machinery, Cast	Structurals, Plates	Malleable	Short Steel Rails
Birmingham	$32.00-33.00	$42.00-43.00	.....	.....	$42.00-43.00	.....	$44.00-45.00
Boston*	**28.50-29.00	**39.00-40.00	.....	**40.00-42.00	.....	.....	.....
Buffalo	31.00-32.00	**38.00-39.00	.....	.....	39.00-40.00	.....	48.00-49.00
Chicago	36.00-37.00	41.00-42.00	.....	46.00-47.00	39.00-40.00	46.00-47.00	48.00-50.00
Cincinnati*	**30.00-31.00	**34.00-35.00	**28.00-29.00	**46.00-47.00	.....	.....	**46.00-47.00
Cleveland	34.00-35.00	39.00-40.00	28.00-29.00	46.00-47.00	38.00-39.00	47.00-48.00	47.00-49.00
Detroit*	27.00-28.00	31.00-32.00	24.00-25.00	.....	.....	.....	.....
Los Angeles	38.00-40.00	44.00-47.00	.....	.....	52.00	.....	.....
New York*	30.00-31.00	34.00-35.00	31.00-32.00	.....	32.00-33.00	.....	.....
Philadelphia	38.00-40.00	40.00	40.00	49.00-50.00	43.00-44.00	49.00	52.00-54.00
Pittsburgh	34.00-35.00	35.00-36.00	.....	45.00-46.00	37.00-39.00	.....	49.00-52.00
St. Louis*	34.00	38.00	32.00	.....	.....	.....	43.00
San Francisco	41.00	46.00	28.00	45.00-46.00	44.00	.....	.....
Seattle	44.00	39.00	.....	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point.

Foundry Statistics



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1959	631,210	443,009	.....
1960			
Feb.	62,925	42,089	66,945
2 mo.	134,462	81,866	.....
Mar.	60,816	39,618	60,267
Apr.	47,553	31,423	56,312
May	50,844	33,551	56,654
June	50,809	34,264	51,960
July	35,117	25,186	52,392
Aug.	45,101	32,549	57,551
Sept.	52,514	34,451	57,480
Oct.	56,205	36,459	57,028
Nov.	53,574	33,758	55,306
Dec.	46,208	29,341	51,516
Totals	623,203	412,466	.....
1961			
Jan.	46,011	30,311	50,940
Feb.	39,946	26,715	45,453
2 mo.	85,957	57,026	.....

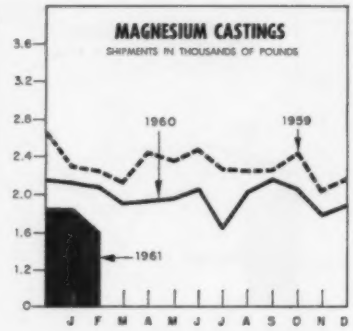
PIG IRON

PRODUCTION*—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1959	1,889,445	2,810,359	3,471,683
1960			
Mar.	126,357	333,182	462,914
3 mo.	402,827	997,199	1,397,336
Apr.	134,509	258,452	395,875
May	135,825	290,067	356,931
June	105,717	247,991	309,942
July	117,218	166,084	290,384
Aug.	78,950	171,718	211,506
Sept.	93,260	202,895	152,880
Oct.	133,525	183,639	208,758
Nov.	122,550	231,203	206,062
Dec.	130,455	153,009	202,353
Totals	1,454,836	2,902,247	3,732,027
1961			
Jan.	106,054	165,571	170,224
Feb.	98,207	144,476	214,396
Mar.	101,306	159,529	222,688
3 mo.	305,567	469,576	607,308

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1959	3,989,129	223,868	351,355
1960			
Jan.	328,242	18,634	45,936
Feb.	321,060	19,257	42,383
2 mo.	649,302	37,891	88,819
Mar.	317,520	21,042	43,959
Apr.	282,178	16,796	36,971
May	292,407	15,730	19,569
June	313,340	16,828	23,720
July	241,752	11,892	21,123
Aug.	273,722	14,697	27,919
Sept.	284,809	13,548	19,942
Oct.	269,103	13,631	13,947
Nov.	254,799	12,867	17,567
Dec.	233,592	12,722	18,344
Totals	3,412,524	187,644	331,200
1961			
Jan.	232,051	13,293	16,375
Feb.	225,222	12,195	21,705
2 mo.	457,273	25,488	38,080



MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1959	27,253	23,109	.....
1960			
Feb.	2,075	1,679	3,278
2 mo.	4,210	3,267	.....
Mar.	1,903	1,524	3,206
Apr.	1,926	1,533	3,133
May	1,953	1,514	2,948
June	2,050	1,555	3,396
July	1,838	1,234	3,541
Aug.	2,025	1,530	3,364
Sept.	2,146	1,653	3,271
Oct.	2,038	1,519	3,274
Nov.	1,776	1,269	3,433
Dec.	1,875	1,345	3,156
Total	23,540	17,943	.....
1961			
Jan.	1,882	1,436	2,847
Feb.	1,610	1,206	2,770
2 mo.	3,472	2,642	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For Sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

"Sure do like this new one"

It's a dandy—the new, compact, heavy-duty Gardner-Denver Model LA compressor. You just hook it up and forget it. It'll take care of your regular air needs for years, with just routine attention. Two-stage Model LB for high-pressure service. Write for Bulletin LA-1.

For More Information Circle 568, Page 39

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Producers of alloys, metals and chemicals

VANCORAM

Malleable Founders' Society To Hold Annual Meeting

Malleable Founders' Society will hold its 1961 annual meeting on June 8-9 at the Broadmoor, Colorado Springs, Colo. Speakers at the meeting are Garry S. Gherman, E. M. Gherman & Co., Chicago, who will talk on "Barriers to Communications" and Harry E. Figgie Jr., Booz, Allen, & Hamilton, Cleveland, whose topic is "Target: 1970." Also, a panel of executives from member companies will discuss "Hitting the Target."

At the annual banquet, the society's McCrea Award will be presented and the president-elect will be introduced. Other features of the meeting include a golf tournament and a tour of the Air Force Academy, Colorado Springs.

Bartlett & Snow Purchased by Pacific Foundry & Metallurgy

C. O. Bartlett & Snow Co., Cleveland, has been purchased by Pacific Foundry & Metallurgy Co., San Francisco, it has been announced by Robert L. Chambers, president of Pacific Foundry, and H. S. Hersey, chairman of Bartlett & Snow. The new corporation will be known as Bartlett-Snow-Pacific.

C. O. Bartlett & Snow Co., founded in 1885, was a pioneer in foundry mechanization, and is a leading designer, engineer, fabricator, and erector of foundry equipment including completely integrated, automated systems for both ferrous and nonferrous foundries. Bartlett-Snow also manufactures dryers, coolers, calciners, kilns, and elevating and conveying equipment for the chemical and other process industries, and a line of specialized grain and feed mill equipment.

Pacific Foundry & Metallurgy Co. started as a proprietorship in the nineteenth century, and was incorporated in 1902. Its Furnace Division is best known for Pacific multiple hearth furnaces used for processing ores and chemicals. The Corrosion Division produces high-silicon iron pipe and fittings for installations requiring maximum resistance to acids and other corrosive materials. The company also has an electric furnace foundry for producing heat, corrosion, and abrasion resisting parts for its furnaces and similar applications.

Mr. Chambers stated that both businesses have historical records of earnings, are currently profitable, and have foreign and domestic orders on their books that exceed the backlogs which were on hand one year ago.

The companies will operate as sep-

SPECTROMETER GIVES FAST ANALYSIS: This direct reading spectrometer is used in General Electric's gray and ductile iron foundry, Elmira, N. Y., to analyze metal in five minutes. An automatic determinator measures carbon and sulfur in each sample, and these results plus those from the spectrometer are relayed to the melting department via a pneumatic tube delivery system. This equipment, two new cupolas, and an electric holding furnace have been installed in the foundry as part of an $800,000 improvement program

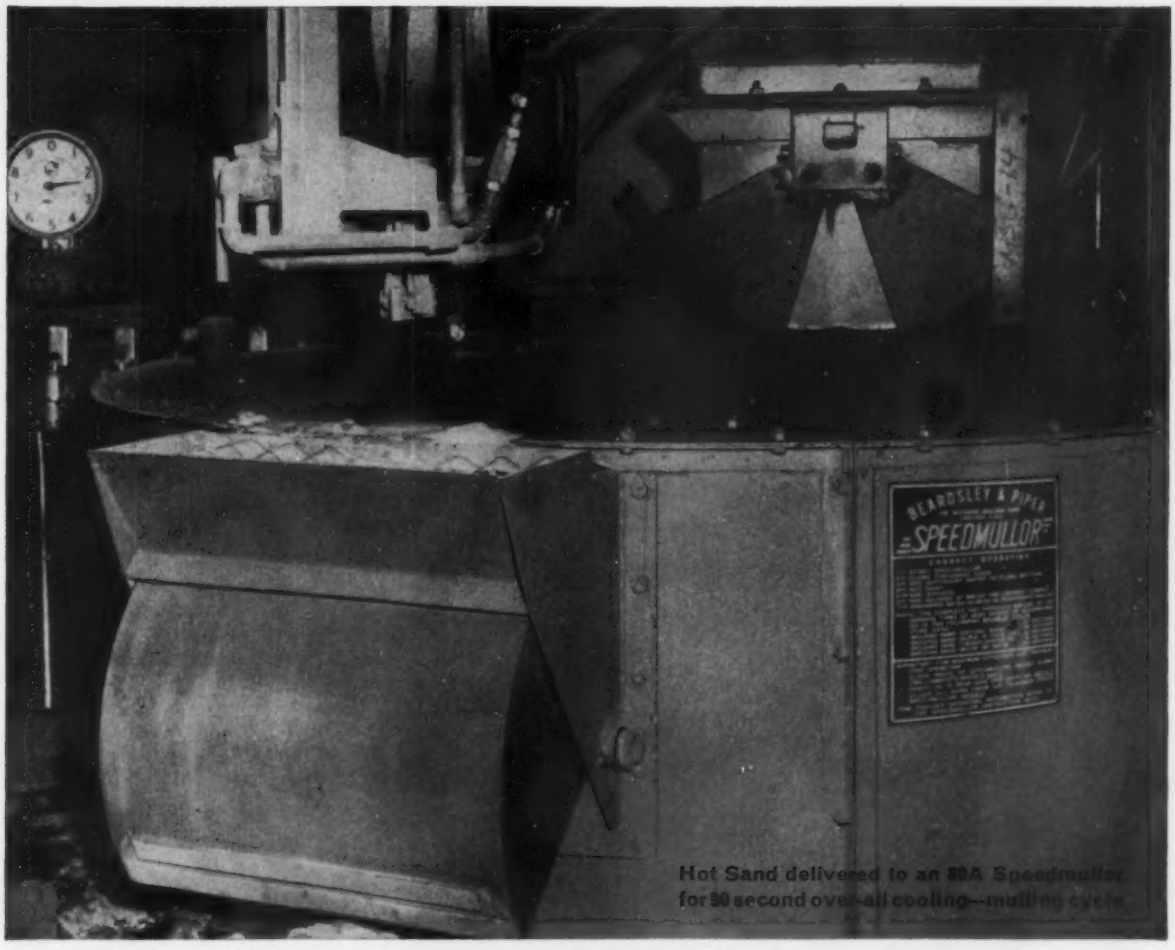
NFA COUNCIL MEETING: Members of the administrative council of the National Foundry Association are shown here during a meeting in Washington. Purpose of the session, in addition to reviewing the affairs of the association, was to discuss with congressional leaders and administration officials current problems and pending legislation affecting the industry

SPEEDMULLORS COOL HOT SAND

Hot Sand Cooled to Within 15°-25° of Room Temperature During Mulling In A 90 Second Cycle

High production—with resultant high metal to sand ratios—makes control of the hot sand problem an economic necessity. Quality castings can be produced only with properly cooled and mulled sand, and the logical place to control sand temperature is in the muller. Cooling is accomplished in the Speedmullor during the high-capacity mulling operation. Regardless of the high temperature of the sand entering the Speedmullor, it is cooled to a temperature where effective mulling can take place during the first 30 seconds of the mulling cycle. (Cooling to the same temperature in a conventional muller requires up to three minutes*). Additional cooling during the balance of the Speedmullor's 90 second cycle serves to bring the temperature of the sand to within 15 to 25° of room temperature. Competitive mullers cannot attain this temperature control without sacrificing capacity—and there is no excessive fines removal or costly loss of expensive binder additions during Speedmullor Cooling.

From B & P RESEARCH . . . the Only Complete Line of Mullers



Hot Sand delivered to an 80A Speedmullor for 90 second over-all cooling—mulling cycle

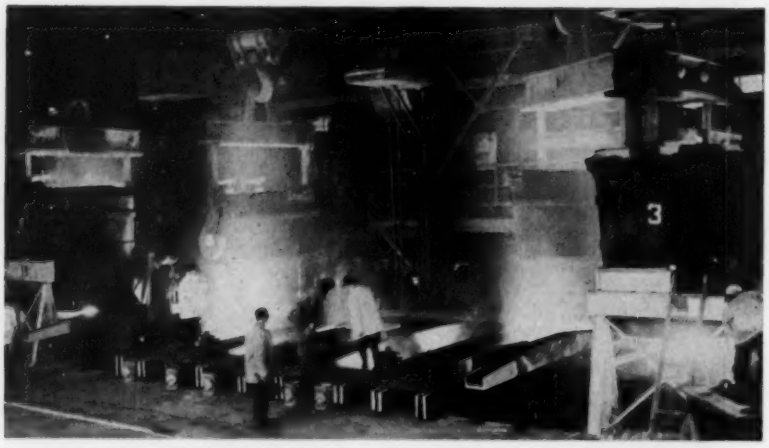
NO EXTERNAL COOLING DEVICES NEEDED—Additional space costs money, and any external cooling device requires additional space. Only Speedmullor cooling solves the hot sand problem with virtually no additional space. There is no comparison between installation cost, operating cost and maintenance cost of Speedmullor Cooling and external cooling devices or cooling elevators. *Speedmullor Cooling Costs Only One-Fourth As Much, Or Less.* External cooling devices normally require expensive additional equipment such as high capacity dust collectors and complex water addition systems. When cooling is accomplished in the Speedmullor the entire mulling and cooling installation is in one compact, low-cost package. Ask your B&P representative for additional Speedmullor facts. Let him show you how a Speedmullor can increase your productive efficiency economically and with no wasted space.

""The Problem Of Hot Molding Sands"* (*R. W. Heine—University of Wisconsin—and others.*)

BEARDSLEY & PIPER 2424 N. Cicero Ave., Chicago 39, Ill.
DIVISION OF PETTIBONE MULLIKEN CORP.

arate divisions of Bartlett-Snow-Pacific. Headquarters of Bartlett-Snow Div. will be continued at 6200 Harvard Ave., Cleveland 5, Ohio. The company has branch offices in New York and other principal cities. The complementary products, services, and facilities of both companies will be utilized fully in greatly augmenting the over-all capabilities of both of the divisions which will make up the new company.

Produces 150-Ton Steel Casting



Twelve 150-ton castings have been ordered from Canadian Steel Foundries Ltd., Montreal, Canada, by Dominion Engineering Works Ltd., which will use them in building steel rolling mills. Cost of the order is said to be $1 million.

The first casting was poured in April and it is being cleaned, heat treated, and tested before work proceeds on the others. As shown in the photograph, four ladles were required to pour the 500,000 lb of steel at 2800° F which were needed to make a sound casting. Pouring time for the quadruple pour, the first in Canada, was three minutes. Finished castings will be 32 ft long, 14 ft wide, and 38 in. thick.

Preparations for the first pour included reinforcing the columns and overhead cranes in the cleaning shop, lengthening the annealing furnace from 25 to 35 ft, and digging a special pit 7 ft deep. About 300,000 lb of sand were required to make the mold. CSF produced two heats in an electric furnace and an oil-fired open hearth and arranged to have two ladles of molten steel furnished by the nearby Canadian Steel Wheel Ltd. These heats were transported half a mile on special cars.

Time from the first heat tap to the time of pouring was 34 min, and the ladles were specially prepared. Each overhead crane was staffed by an operator, a standby worker, and a crane maintenance mechanic. Over a 14-hr period following the pour, an additional 40,000 lb were poured to compensate for contraction. A 14-day waiting period was necessary before the casting was cool enough (800° F) to allow workers in asbestos suits to cut off the casting heads. Then the casting was slid on heavily-greased steel sheets to the cleaning department.

After chipping had been completed, the casting was shot blasted one end at a time since it was too big to fit into the shot blasting room all at once. Final steps were annealing, trimming, grinding, and ultrasonic inspection.

BCIRA Undertakes Translation Of Russian Foundry Journal

British Cast Iron Research Association is translating *Liteinoe Proizvodstvo*, leading Russian monthly for foundrymen. The first translation, of the January, 1961, issue, appeared in May under the title of "Russian Castings Production."

Emphasis is on steel and cast iron, including gray, white, malleable, nodular, and alloy, but there are articles dealing with nonferrous castings. All aspects of castings production are covered, from raw materials through melting processes and equipment, molding sands and methods, casting and cleaning, to the service behavior of the finished product.

Normal publication date will be two months following the Russian issue date. The translation has a page size of 8¼ x 11¼ and is printed by letterpress. Subscription rates outside the United Kingdom

CHECKING CORES: A stainless steel mirror is employed in an American Brake Shoe Co. foundry to check sand cores in molds made with heavy flasks. Use of the mirror eliminates the need for workers to crawl under molds to inspect them and to chance being crushed should a support collapse. The bright, reflective surface also resists scratches, corrosives, and hot metal splatters. It cleans easily

Sterling's all-time heavyweight champion

Extra Heavy Duty

FOUNDRY FLASK

...always the huskiest performer on any foundry floor

PERFORMANCE-PROVED BENEFITS OF THIS ADVANCED STERLING DESIGN

- Individually Engineered
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- Stress Relieved If Desired
- Jig-Welded Fittings
- Precision-Machined Surfaces
- Accurately Installed Pins and Bushings

For sheer brute strength and endurance... none today can match Sterling's extra heavy duty flask construction. Product of an extensive laboratory and field research program, this outstanding development coordinates in one unit many of the important breakthroughs in metallurgy, welding and design.

In every detail, advanced techniques, extra safety factors and high-performance engineering concepts are included in this design to assure unmatched endurance and long service. In accuracy, too, low-tolerance machining of flanges combined with accurately-matched pins and bushings help to produce castings capable of meeting today's rigid specifications. Here's proof again that, when profits are at stake, it always pays to depend on Sterling.

For More Information Circle 571, Page 39

AO-4838

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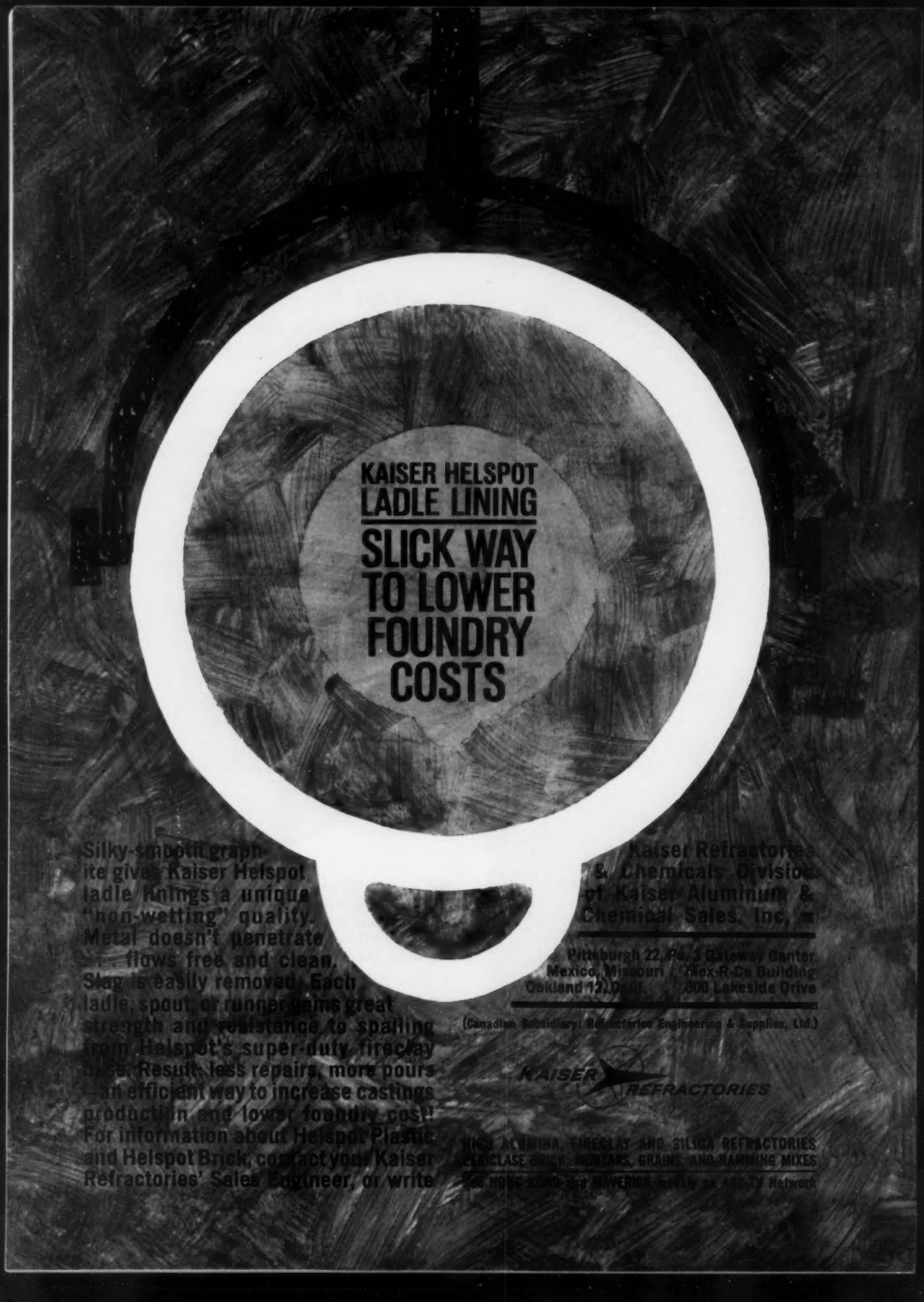
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Silky-smooth graphite gives Kaiser Helspot ladle linings a unique "non-wetting" quality. Metal doesn't penetrate . . . flows free and clean. Slag is easily removed. Each ladle, spout or runner gains great strength and resistance to spalling from Helspot's super-duty fireclay bond. Result: less repairs, more pours . . . an efficient way to increase castings production and lower foundry cost! For information about Helspot Plastic and Helspot Brick, contact your Kaiser Refractories' Sales Engineer, or write
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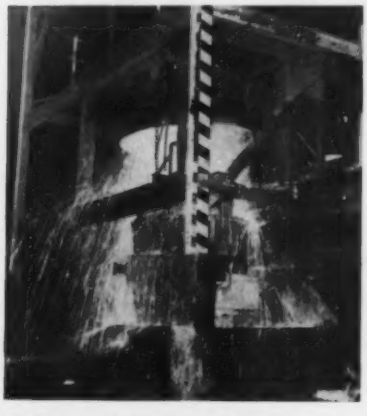
are $35 for twelve issues or $5 for a single issue. It can be ordered from the association at Bordesley Hall, Alvechurch, Birmingham, England.

IMC To Sponsor Additional Foundry Marketing Conferences

International Minerals & Chemical Corp., Skokie, Ill., plans to expand the foundry marketing conference program introduced last January in Milwaukee. The program aims to bring together production and sales viewpoints for improved over-all marketing of castings by all foundries.

Tentatively, one meeting is being arranged for the Cleveland-Pittsburgh area, another for southern Ohio-Indiana, and a third for the New York-Philadelphia area.

In addition, concentrated and more detailed workshop meetings are planned in the general locations covered by the initial conferences. These meetings will be for smaller groups of foundries, covering smaller areas.



OXYGEN-BLOWN CHROME — Paralleling development of the practice employed in steelmaking, Union Carbide Metals Co. recently has introduced oxygen blowing into the refining of chrome. The view here is at the company's plant in Marietta, Ohio. The process is said to result in a highly improved quality of refined chrome for use in production of iron and steel castings, stainless steels, and tool steels.

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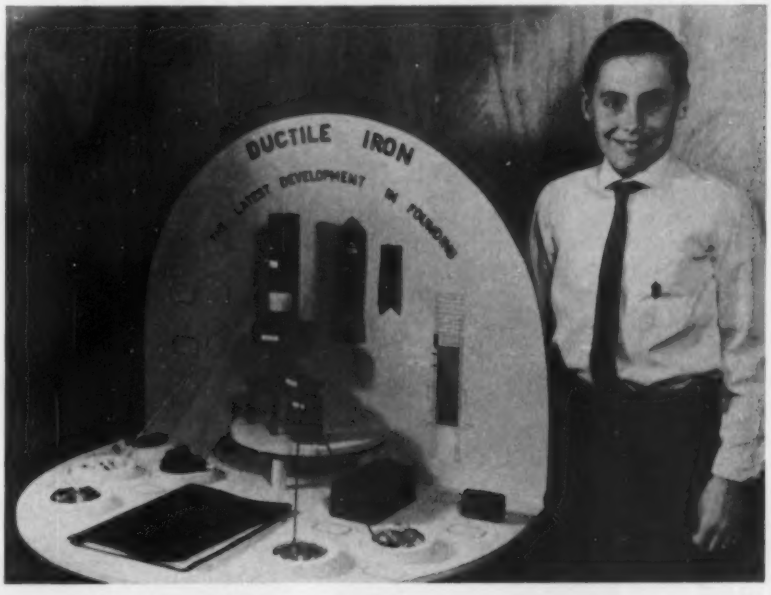

Ductile Iron Exhibit Wins Prize

The foundry industry in general and ductile iron specifically received publicity in the form of a science fair exhibit recently. John R. Hood Jr., Grand Rapids, Mich., built a display describing how ductile iron is made and the nature of its properties, and its uses. John's father is foundry division superintendent of Oliver Machinery Co.'s Grand Rapids foundry.

The exhibit won first prize in the physical science classification at Riverside Junior High School which John attends. This win entitled him to take the exhibit to the Kent County Science Fair, where he was awarded an honorable mention in the junior high classification.

The display includes a model of a cupola, all the raw materials, and inoculation alloys for producing ductile iron. A ladle is in place under the cupola spout, and a core sand half mold, together with a core plus a casting are at the right side. To the left of the cupola are sketches of gray and ductile iron graphite formation, and to the right a sketch of a cupola cross-section showing the layers of charges. The notebook explains the difference between gray and ductile iron and gives other facts.

Gray Iron Founders' Design Contest Closes July 15

Annual design contest sponsored by the Gray Iron Founders' Society closes July 15. This contest, intended to encourage designers to utilize gray and ductile irons, is open to anyone who has designed a gray or ductile iron casting.

Designs will be judged on functional qualities, cost, appearance, or general commercial importance. Redesigns or conversions will be checked for improved product efficiency, reduced costs, and savings in equipment and time as the result of the change.

Seven cash prizes include $500 for first, $100 for second, and $50 for each of five third places. Rules and entry blanks can be obtained from the society's headquarters at National City-E. Sixth Bldg., Cleveland 14, Ohio.

IMC A REPORT TO FOUNDRIES FROM TOM BARLOW

"Green strength bugs me!"

A short time ago, I had the pleasure of kicking around the subject of "green strength" with a nice "guy named Joe." (Not to be confused with the movie of the same name!) We got to wondering who really started foundrymen off on this "green strength" kick — and why someone doesn't set the record straight. Let's first assume that you agree with Joe and me that "green strength," as such, is *not* a good test for the following reasons:

1. It's a compression test — but sand seldom fails in compression.
2. The molding sand does not stay "green" — it is dry (on the surface, at least) immediately after pouring.
3. Good castings are being made every day in sand ranging from 4 psi to 30 psi green strength. (So what?)
4. A given sand can be "good" or "bad" without any change in the green strengths.
5. Most defects are "hot" sand defects.

Now we don't say the test is of no value at all . . . but why do we hang our hat on what *could* be the least valuable of the sand tests? Is it the fault of the foundrymen, who insist on a simple, easy test regardless of its value? Is it the fault of the testing-equipment people? Is the fault of the muller people who talk about their "efficiency" in developing maximum green strength? Or, is it the fault of people like us who advertise our Dixie Bond as being the *highest green strength bond clay?* (Even though we freely admit that Revivo is weaker than Dixie or Black Hills, we still boast about the fact that it is the highest green strength of the fire clay bonds.) We all seem to be caught in the same trap — green strength seems to be our mutual language. We don't seem to have enough other mutually understandable terms in which to communicate properly. Does this do any harm? In a way it does!

If we carry our green strength thinking too far, we find ourselves spending half our time fighting expansion defects. We add various types and amounts of "anti-bonds" or "cushions" to offset the lack of clay in the system. We start worrying about silica-flour, iron oxide, pitch, sea-coal, and other materials to control our hot strength and hot deformation. Pretty soon, we have a nicely complicated sand system — *but we have succeeded in using the minimum amount of clay.* Clay — probably the cheapest "cushion," the cheapest control over mold-wall movement, the cheapest insurance against casting defects since horse-manure became hard to get commercially.

So we get smart. We run higher and higher green strengths — not because we need green strength, but because we need clay. We go into *controlled* "undermulling" so as to be able to use more clay without too much green strength. We aim for maximum *moldability.* The pendulum swings.

What this country needs — even worse than a good five cent cigar — is a bond clay with low hot strength at 1000° F (to stop scabs, buckles, and rattails); good dry strength to avoid erosion scabs; high hot strength at 2000° F., plus high hot plasticity (to avoid cuts without getting hot tears and cracks); good collapsibility and *low* enough green strength to permit a minimum of 8% clay to be used without the sand becoming hard to ram. Right now the closest we come to this ideal clay is in the use of combinations of Revivo, Dixie, and Black Hills in an attempt to get the best of each. And, let's not knock them, these combinations can be and are successful. Maybe we can help you formulate a combination to suit your particular requirements. We believe we're pretty good at it.

I've made my pitch — we believe our products *and our services* can help you produce better and, therefore, more salable castings. I said it and I'm glad! But I can't help wondering if we came up with a single clay that could do everything described above — how would we advertise it? The most *what?* The most moldable? The most wanted? Or would we fall back on our past habits and advertise "the highest green strength of the low-green strength bond-clays? The answer sure bugs me. How about you?

EASTERN CLAY PRODUCTS
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PRODUCTS FOR GROWTH*
*TRADEMARK
EC-10-61
ADMINISTRATIVE CENTER, OLD ORCHARD ROAD, SKOKIE, ILLINOIS, YORKTOWN 6-3000

For More Information Circle 573, Page 39

Fast PAYLOADER® handling

increases foundry production

Iowa Malleable Iron Co. in Fairfield, Iowa, faced the problem of finding a faster method of handling synthetic sand to and from the re-conditioning process. Speeding-up the turn-around of this sand would provide a sizeable increase in molding production.

Two Model HA PAYLOADER tractor-shovels (2,000-lb. operating capacity) were purchased for this purpose in 1959. The results obtained were so satisfactory that another, larger capacity PAYLOADER (2,500-lb. H-25) was added 15 months later. Today these units handle 60 to 70-tons of synthetic sand twice during an 8-hour shift . . . feeding stockpiled sand into the cleaning-conditioning plant, distributing sand to various molding stations, plus all miscellaneous handling duties throughout the plant.

Foundries and Plants of all kinds have found the answer to *more efficient bulk handling* in PAYLOADER tractor-shovels. Each unit is a flexible material handling system. It needs no special or expensive installation . . . requires only one operator . . . loads itself, travels any path, handles all kinds of loose bulk material, small castings or large lumps of slag. For special jobs, interchangeable Fork Lift, Hydraulic Grabs and Sweeper attachments are available.

There's money-saving performance built-into all PAYLOADER units. Available in 8 sizes and 20 models (from 2,000 to 12,000-lb. operating capacity), they fit every material handling need. Contact your Hough Distributor nearby or write for more detailed information.

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703 Sunnyside Ave.
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6-A-2

Steel Founders Have Improved Safety Record During 1960

Lost-time injury frequency rate in the steel foundry industry decreased approximately 12½ per cent in 1960, according to the Steel Founders' Society of America. Member foundries reported a drop in frequency rate from 18.5 in 1959 to 16.2 last year.

Causes involving material handling accounted for 66 per cent of all accidents. The three leading causes of accidents in 1960, which accounted for approximately 49 per cent of all accidents, were (in order of frequency) 1. Improper use of hands, feet, or body. 2. Working in improper position or posture. 3. Running, jumping, or roughness.

ASA Publishes 1961 Catalog

American Standards Association has published a 1961 *Catalog of American Standards* which contains almost 2000 entries.

The booklet is available without charge from ASA at Dept. PR 214, 10 E. 40th St., New York 16, N. Y.

TIGHT PACKAGE—Improved packaging and a consumable skid save money for Republic Metals Co., Brooklyn, N. Y., in shipping lead bars and solder. Pilfering from wire-bound skids and breakage were eliminated when Stanley steel strapping, with the company's name in half-inch letters on it, was substituted for the wire. Skids are made of the same grade of metal as that being shipped. Skid loads can be stacked to a height of 8 feet, saving floor space.

Available when and where you need it for foundry and die casting uses

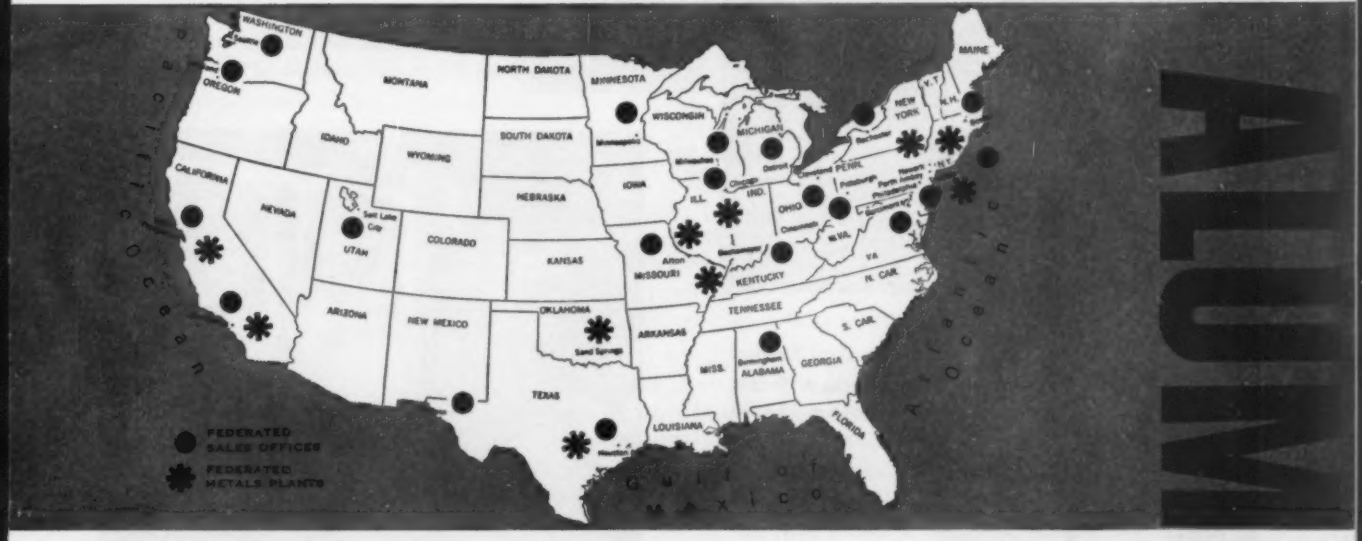
REVERE PRIMARY ALUMINUM

Revere Primary Aluminum for foundry and die casting applications is always available when you need it, in exact quality and quantity you specify. There are no time-consuming, costly delivery delays to build into your production lead-time, because . . .

Revere Primary Aluminum, in all the standard alloys, comes to you through Asarco's Federated Metals Division, which maintains a national network of strategically located sales offices and stockpoints. And offers . . .

The services of on-the-spot Field Metallurgists, who diagnose and help solve your aluminum casting problems, as well as the staff and facilities of Asarco's Central Research Laboratories

For your copy of Bulletin 195, "Revere Aluminum for the Casting Industry," write to American Smelting and Refining Company, 120 Broadway, New York 5, N. Y.



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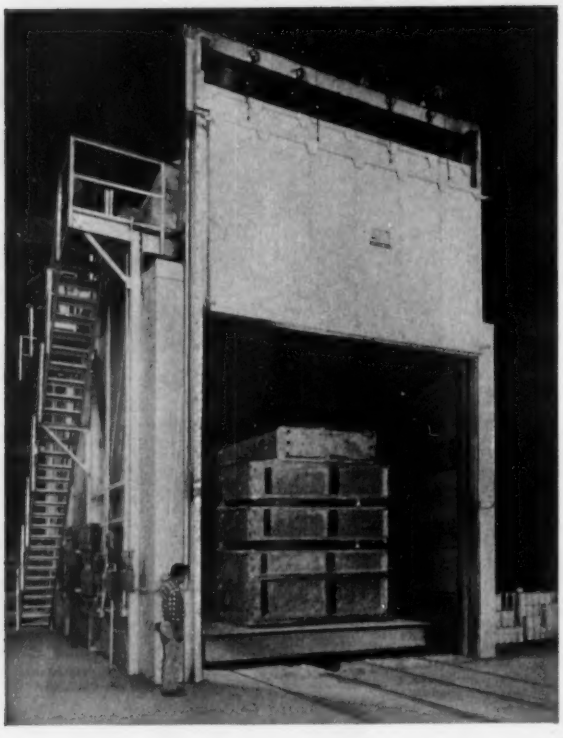
SURFACE DRY or "BONE" DRY
COLEMAN OVENS

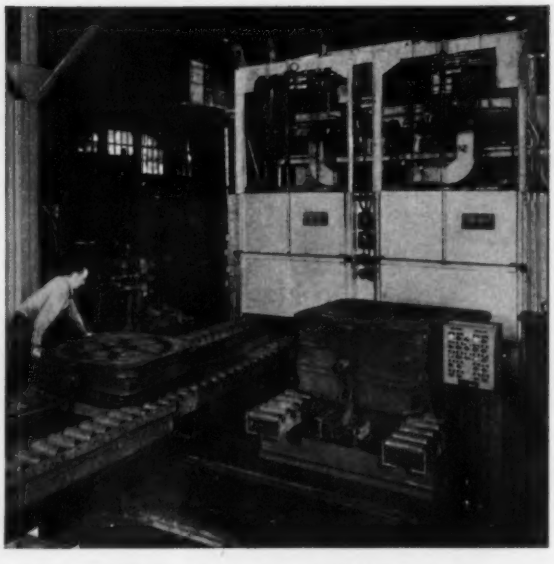


Dry Molds Best!

Below: Two Coleman *JET-ACTION®* High Speed Mold Ovens in a gray iron foundry dry up to 60 molds per day.

Ingenious push button controls enable one operator to index cope and drag molds through the oven on a semi-continuous conveyor system. Ovens are heated by individual *JET-ACTION®* Recirculating Systems.

Coleman *JET-ACTION®* Ovens provide such benefits of dry sand practice as better casting finish—fidelity to pattern—lower cleaning costs with added advantages of reduced handling costs and accelerated flask turnover.



Above: Car-Type Mold Oven in leading steel foundry is one of the largest in the world. Door opening is 16 feet wide x 18 feet high; useful inside work space is 11,000 cubic feet!

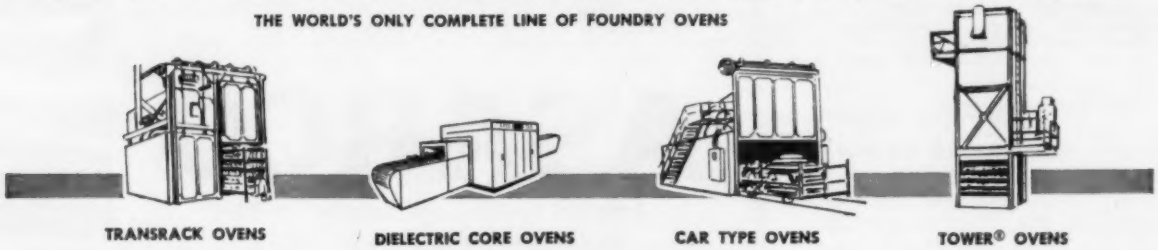
Combination gas and oil fired recirculating air system provides heating capacity to "bone" dry a 300 ton load of molds at temperatures up to 800° F. Heavy duty, sub-floor car moving system and doors at each end of oven are push button controlled.

Write for Bulletin 54.

THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

World's Oldest and Largest Foundry Oven Specialists — More than half a century of specialized foundry experience.

THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS **DIELECTRIC CORE OVENS** **CAR TYPE OVENS** **TOWER® OVENS**

For More Information Circle 576, Page 39

Calendar of MEETINGS

June 5-7—American Society for Quality Control, annual convention and exhibit, Sheraton Hotel, Philadelphia.

June 8-9—Malleable Founders' Society, annual meeting, Broadmoor, Colorado Springs, Colo.

June 11-15—Air Pollution Control Association, annual meeting, Hotel Commodore, New York.

June 13-14—Connecticut Safety Society, annual meeting, Statler-Hilton Hotel, Hartford, Conn.

June 18-20—Alloy Casting Institute, annual meeting, Homestead, Hot Springs, Va.

June 18-24—28th International Foundry Congress, Vienna, Austria.

June 19-21—Material Handling Institute, Great Lakes Show, Cobo Hall, Detroit.

June 20-21—Investment Casting Institute, technical course, Case Institute of Technology, Cleveland.

June 22-24—Penn State Regional Foundry Conference, Pennsylvania State University, University Park, Pa.

June 25-30—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Aug. 28-Sept. 1—International Heat Transfer Conference, University of Colorado, Boulder, Colo.

Sept. 11-13—European Investment Casting Congress, Italy.

Sept. 18-20—Non-Ferrous Founders' Society, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 21—Cast Bronze Bearing Institute, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 21-22—Missouri Valley Regional Foundry Conference, Missouri School of Mines and Metallurgy, Rolla, Mo.

Sept. 24-26—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 27-28—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Oct. 5-6—Ohio Regional Foundry Conference, Netherland Plaza Hotel, Cincinnati.

Oct. 7-10—Conveyor Equipment Manufacturers Association, annual meeting, Ponte Vedra Inn, Ponte Vedra Beach, Fla.

Oct. 18-20—Gray Iron Founders' Society, annual meeting, Royal York Hotel, Toronto, Ont.

Oct. 19-21—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 23-25—Abrasive Grain Association, fall meeting, Waldorf-Astoria Hotel, New York.

Oct. 23-27—American Society for Metals, National Metal Congress & Exposition, Cobo Hall, Detroit.

Oct. 26-27—Purdue Metals Casting Conference, Purdue University, Lafayette, Ind.

Nov. 13-15—Steel Founders' Society of America, Technical & Operating Conference, Hotel Pick-Carter, Cleveland.

Nov. 15-17—National Foundry Association, annual meeting, Savoy-Hilton Hotel, New York.

Nov 17-18—East Coast Regional Foundry Conference, New York.

Dec. 6-8—American Institute of Mining, Metallurgical, & Petroleum Engineers, Electric Furnace Conference, Penn-Sheraton Hotel, Pittsburgh.

At Wagner Castings Co....

25% savings in shipping labor with Wirebound Pallet Boxes

Bulk handling speeds weighing and shipping of castings

Savings of 25% to 30% have been realized by switching from bags and returnable wood pallet boxes to non-returnable Wirebounds at Wagner Castings Co., Decatur, Ill.

The time required to fill and tie bags, and the cost of returning wood pallet boxes have been eliminated. Even with their 1400-pound loads, these Wirebound pallet boxes stack safely three and four high on the shipping dock, conserving valuable space and speeding shipping operations.

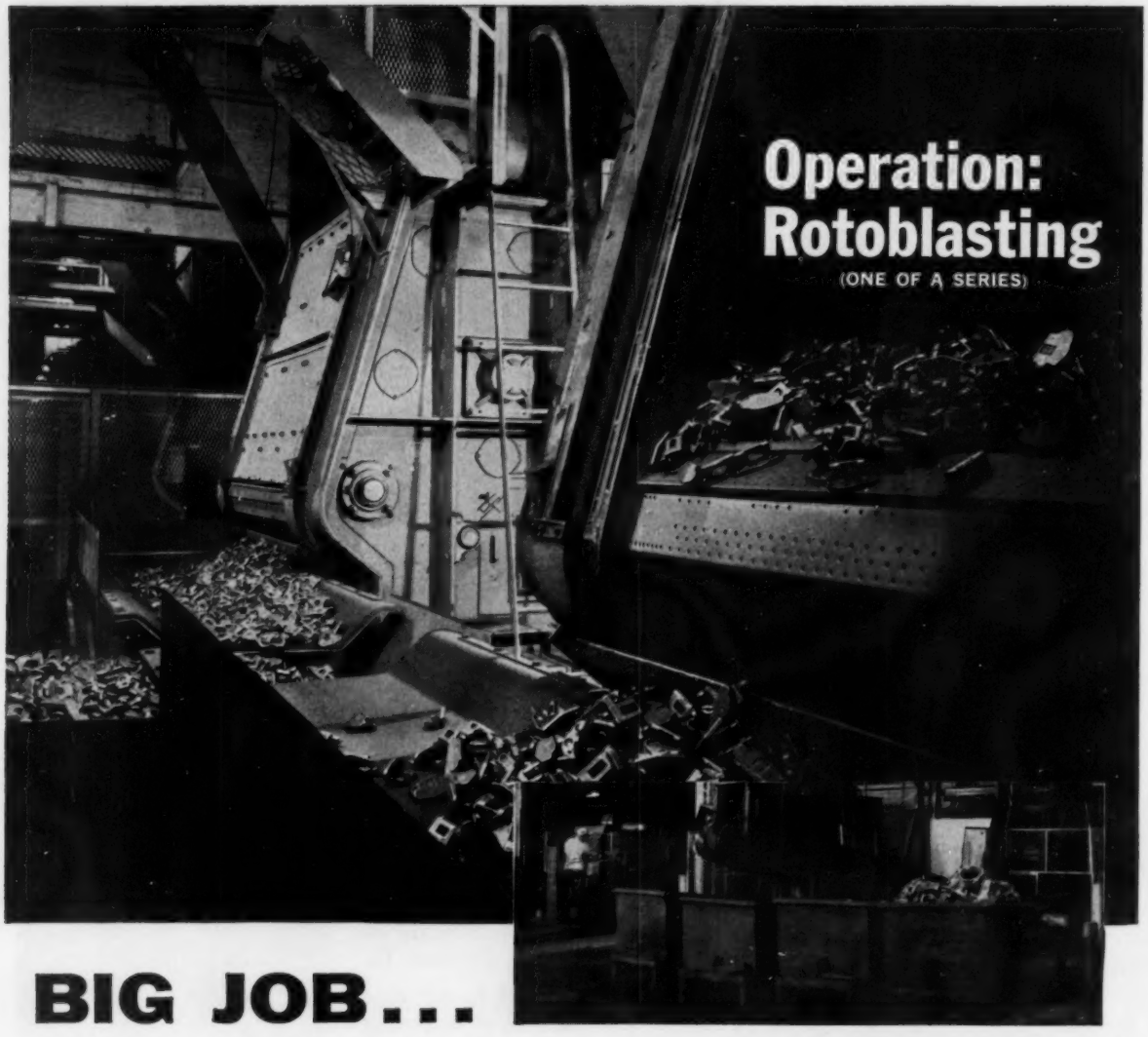
Wagner's customers realize savings, too: handling is minimized—there are no bags to open, no boxes to return. Contents of the Wirebound pallet boxes are accessible for quick identification and for receiving inspection.

At Wagner, Wirebound pallet boxes loaded with malleable iron castings weigh in at about 1400 lbs.

You can realize similar savings by using Wirebound pallet boxes in your manufacturing, assembly and shipping operations. *Contact Wirebound box manufacturers for full information or write to the address below.*

WIREBOUND BOX
MANUFACTURERS ASSOCIATION INC.
222 W. Adams Street, Room 1468
Chicago 6, Illinois

1094



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Bigger results with ROTOBLAST!

Day in, day out, seven heavy duty Rotoblasts work hard at cleaning the tremendous volume of castings produced at a large famous automotive foundry in the Midwest. At last count, each of the seven barrels had accumulated more than 600 hours of actual blast time with practically no need for maintenance or repairs.

Proof of the almost completely automatic operation of these machines is that just two men operate a line of six. (The seventh has a separate location for materials handling convenience.)

Whether your cleaning needs are big or small, Rotoblast has a standard type and size for the job, or specially designed equipment can be provided. Labor-saving automation can be furnished in a small unit just as easily as in seven big ones.

Try Rotoblast abrasives, too!

A special heat-treating process makes Rotoblast Steel Shot and Grit solid, tough, able to take more punishment than ordinary abrasives. Because they are *extra* tough, Rotoblast abrasives last longer, work harder and lower your replenishing costs. We'll be glad to go into more detail. Just write:

PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.; Pangborn Canada, Ltd., 47 Shaft Road, Toronto (Rexdale), Canada—*Manufacturers of Blast Cleaning, Vibratory Finishing, Dust Control Equipment; Rotoblast® Steel Shot and Grit®.*

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FOUNDRY

Reader Information Service

Advertising content is classified by subject and listed by page number for your convenience when studying specific foundry applications. For further information on subjects advertised, refer to advertisement on the page indicated and circle Item Number on Reader Service Card —Page 39.

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"Electric arc melting gives us improved metallurgical quality at an economic advantage," says Birdsboro Corporation.

Steel castings provide a wide range of selective materials, both as to chemical analysis and mechanical properties, which are suitable for application in various service and environmental conditions. The recent selection by Birdsboro Corporation of two new electric arc furnaces to replace open hearths and to complement existing arc melting facilities has contributed markedly to diversification of their steel foundry operations to meet these requirements.

Demand has been matched with flexible melting capacity through installation of two Heroult Electric Arc Melting Furnaces:

Shell Size	Capacity	Melting Rate
8-foot	10-ton	2 tons per hour
13.5-foot	30-ton	7 tons per hour

These two furnaces increase total electric melting capacity to 300 tons per day.

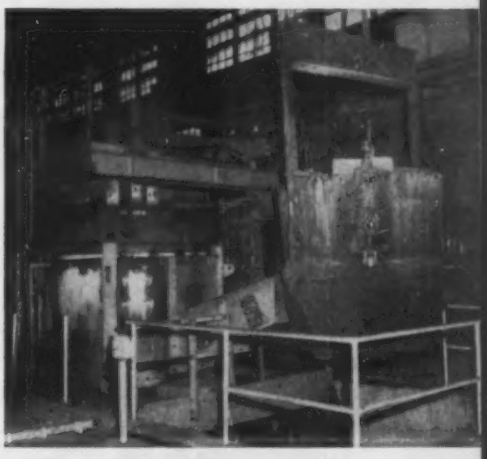
Service to customers was the primary requisite in Birdsboro's selection of this equipment. In addition, sales possibilities have increased, quality of metal is superior, alloy recovery is higher, maintenance is reduced, and man-hours per ton is lower. Result—steady improvement of steel melting costs.

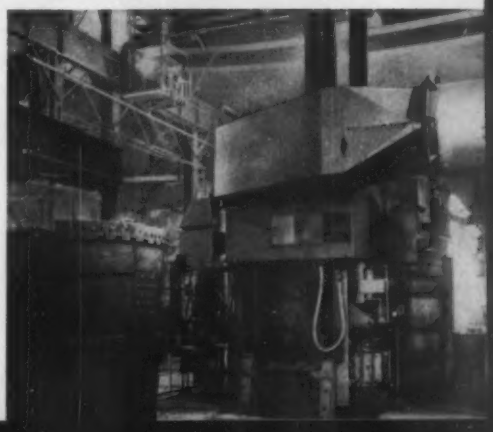
American Bridge constructs furnaces for all types of arc melting, in charge capacities to over 200 tons. You can select door-charge or swing roof top-charge types. Your crew can easily maintain a Heroult furnace.

If you're after melting flexibility, increased production, and lower costs, check American Bridge's complete design, construction and installation service.

USS is a registered trademark

This mark tells you a product is made of modern, dependable Steel.





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USS

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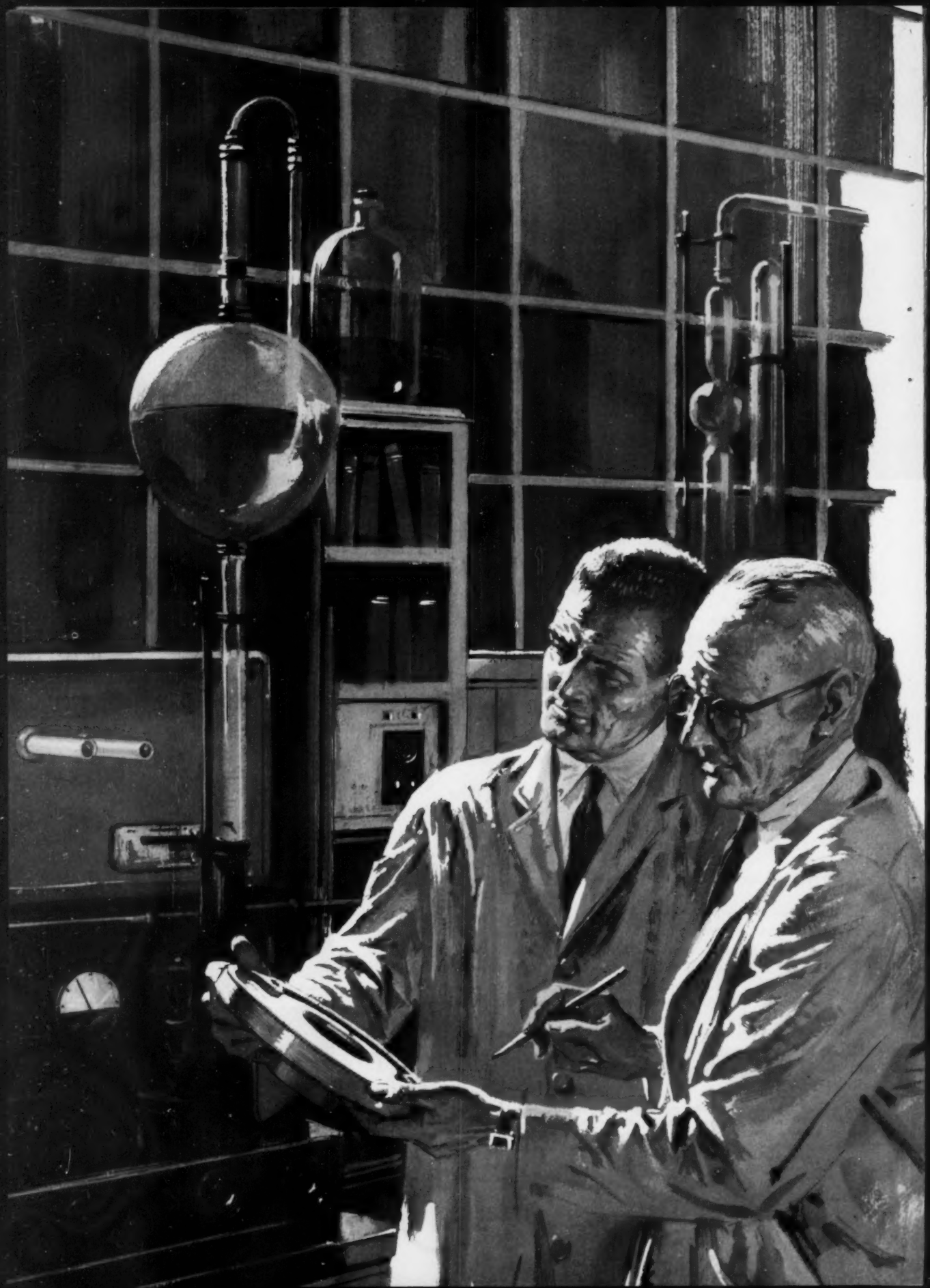

CARDOX

CO_2 Technology makes the difference

Carbon dioxide core and mold hardening has had much publicity; but as every experienced foundryman knows, *how* the processes are employed makes the difference. This is why so many foundries look to Cardox CO_2 technology to bring into practical reality the many advantages and economies the processes have to offer. Cardox was one of the first to introduce the CO_2 mold and core hardening process in American foundries, and ranks today as a leading authority.

Cardox foundry specialists are experts in sand formulations and gasing techniques. Their breadth of experience can show you how to produce dimensionally accurate castings at a cost comparable to green sand molding or less. Cardox semi-precision molding techniques save on pattern costs and prolong pattern life. Cardox CO_2 core hardening process produces finished cores right in the core box... no core dryers are needed, no baking is required. Cardox CO_2 mold and core hardening processes can be used with both ferrous and non-ferrous metals, for single unit or automatic high volume production and in any foundry large or small.

Get all the facts today and see the difference Cardox CO_2 technology will make in your operations. Call your Cardox foundry specialists or write for Bulletin C8-F106. CARDOX, Division of Chemetron Corporation, 840 N. Michigan Ave., Chicago 11, Ill.

CARDOX—Reg. T.M. Chemetron Corporation

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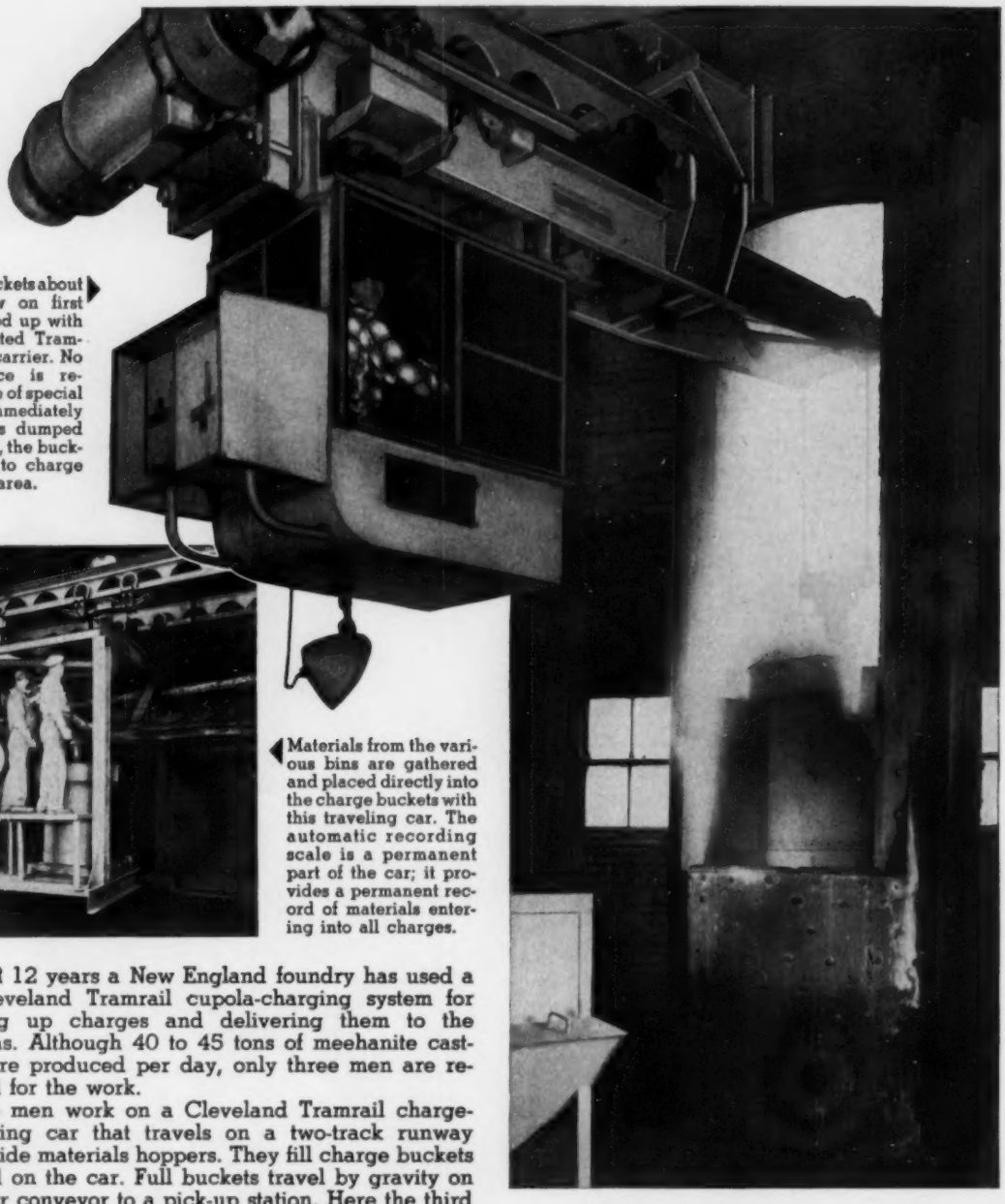
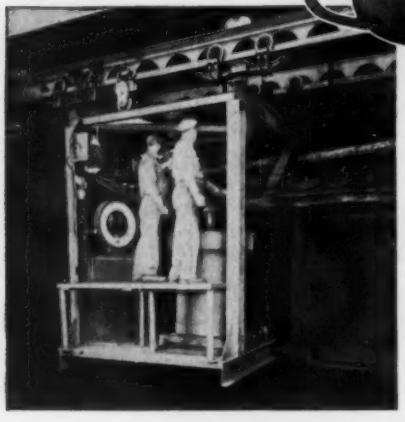
A Simple Efficient Cupola Charging System

Serves Foundry Producing 45 Tons Castings Daily



Full charge buckets about 25 feet below on first floor are picked up with this cab-operated Tramrail charging carrier. No floor assistance is required because of special hoist hook. Immediately after charge is dumped into the cupola, the bucket is returned to charge accumulation area.



Materials from the various bins are gathered and placed directly into the charge buckets with this traveling car. The automatic recording scale is a permanent part of the car; it provides a permanent record of materials entering into all charges.

FOR 12 years a New England foundry has used a Cleveland Tramrail cupola-charging system for making up charges and delivering them to the cupolas. Although 40 to 45 tons of meehanite castings are produced per day, only three men are required for the work.

Two men work on a Cleveland Tramrail charge-gathering car that travels on a two-track runway alongside materials hoppers. They fill charge buckets placed on the car. Full buckets travel by gravity on a roller conveyor to a pick-up station. Here the third man, who operates the Cleveland Tramrail cupola charging carrier, lowers the hoist hook from the floor above and picks up the buckets. These are delivered to one of the two cupolas and materials discharged through the bucket bottoms.

Only three charging buckets are required, yet nine tons are melted per hour. The system has proven fast, efficient and easy to maintain.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

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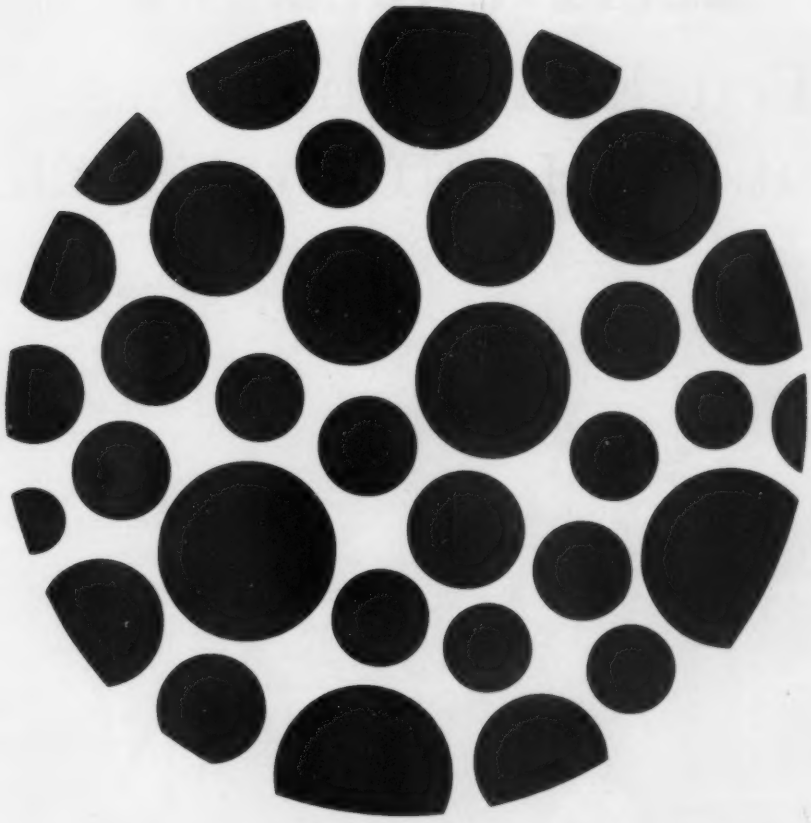
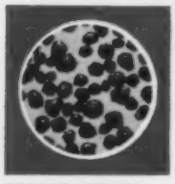


TERMCO IS HARD, ROUND-GRAIN CARBON SAND

TERMCO—the revolutionary new molding medium—is not crushed or pulverized. It's a solid, uncoated, readily moldable 4-sieve sand. It has an AFS fineness number of approximately 70. And TERMCO expands only ⅛ as much as silica sand! That's why TERMCO cores and molds are so much more dependable—especially for the most difficult casting jobs. There's no veining, scabbing, penetration or burn-on. Castings just naturally come cleaner, more accurate, precise. And TERMCO replaces zircon, olivine, and other non-silica sands at lower net cost. Requires no special methods or equipment. Why not get all the facts on TERMCO—now! Send today for detailed information.



UNRETOUCHED MICROPHOTO

New Molding Medium for Highest Quality Castings

TERMCO®

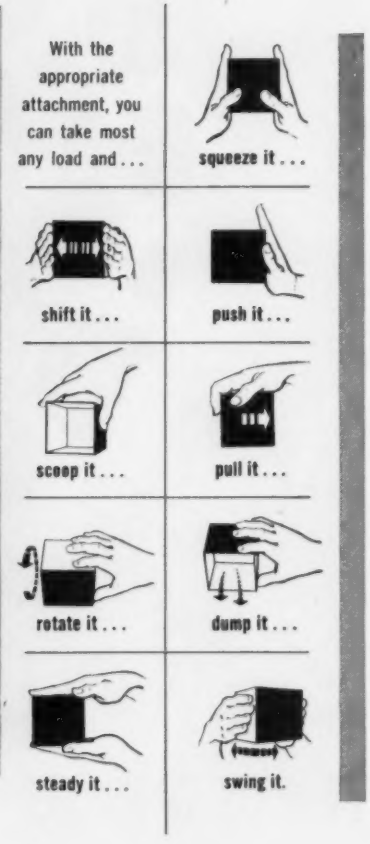
HUMBLE OIL & REFINING COMPANY • DETROIT 18, MICHIGAN • U. S. PATENT NOS. 2630342, 2930913.

ALLIS-CHALMERS

Lift Truck Attachments

Put the HAND in "Handling"...

Tote box is being dumped with a rotator-equipped Allis-Chalmers lift truck. Rotator will travel 360° in either direction.



Owners find a big dollar-saving difference in the performance, ease of servicing, and over-all durability of Allis-Chalmers lift trucks.

And these advantages are not confined to routine pallet-handling jobs, either. The full line of easy-to-mount attachments makes Allis-Chalmers lift trucks almost as flexible as your own two hands.

Have your Allis-Chalmers dealer show you how the right attachment quickly pays for itself by extending the usefulness of the lift truck — by moving a larger volume of material and by reducing damage. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

***POWER* FOR A GROWING WORLD**

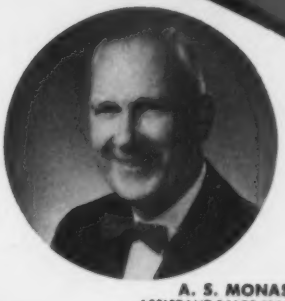
BH-169A

HIGHEST QUALITY CHAPLETS and CHILLS at LOWEST COSTS

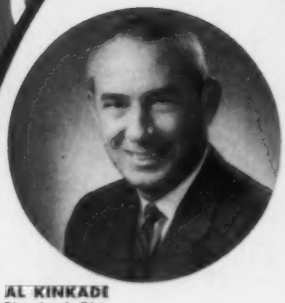
for IMMEDIATE SERVICE

call your FANNER MAN

A. R. ST. CLAIR
SALES MANAGER
Cleveland, Ohio
SHadyside 1-6000



A. S. MONAS
ASSISTANT SALES MANAGER
Cleveland, Ohio
SHadyside 1-6000
Territory: South and West Coast; Eastern Pennsylvania; East Coast, South of New York



AL KINKADE
Cleveland, Ohio
SHadyside 1-6000
Territory: Ohio; Western Pennsylvania; West Virginia

the FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

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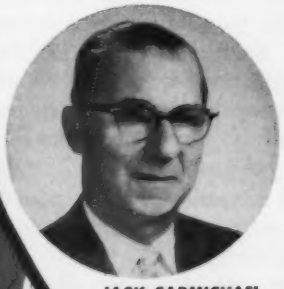
SH 1-6000



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- Unequalled quality and delivery
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For More Information Circle 584, Page 39

Action When Our Customers Need it Most!

Shipped on an interim basis, this high frequency induction furnace got an Inductotherm customer back into business less than 24 hours after an unfortunate pouring accident temporarily put his old unit out of commission. Such service is part of Inducto's concept of doing business . . . an obligation we feel to keep every customer's furnaces pouring on schedule regardless of emergencies. Should trouble develop, Inductotherm usually has a trained engineer on the spot in a matter of hours. Emergency orders are stamped for special priority . . . replacement parts shipped immediately from Inducto's complete inventory—all to assure that your work will be started at once and continued into overtime if necessary.

But service is only one of the overall cost-saving benefits Inductotherm offers. For a look at the entire story, ask to have an Inducto engineer call. Inductotherm Corporation, 412 Illinois Ave., Delanco, N. J.

INDUCTOTHERM

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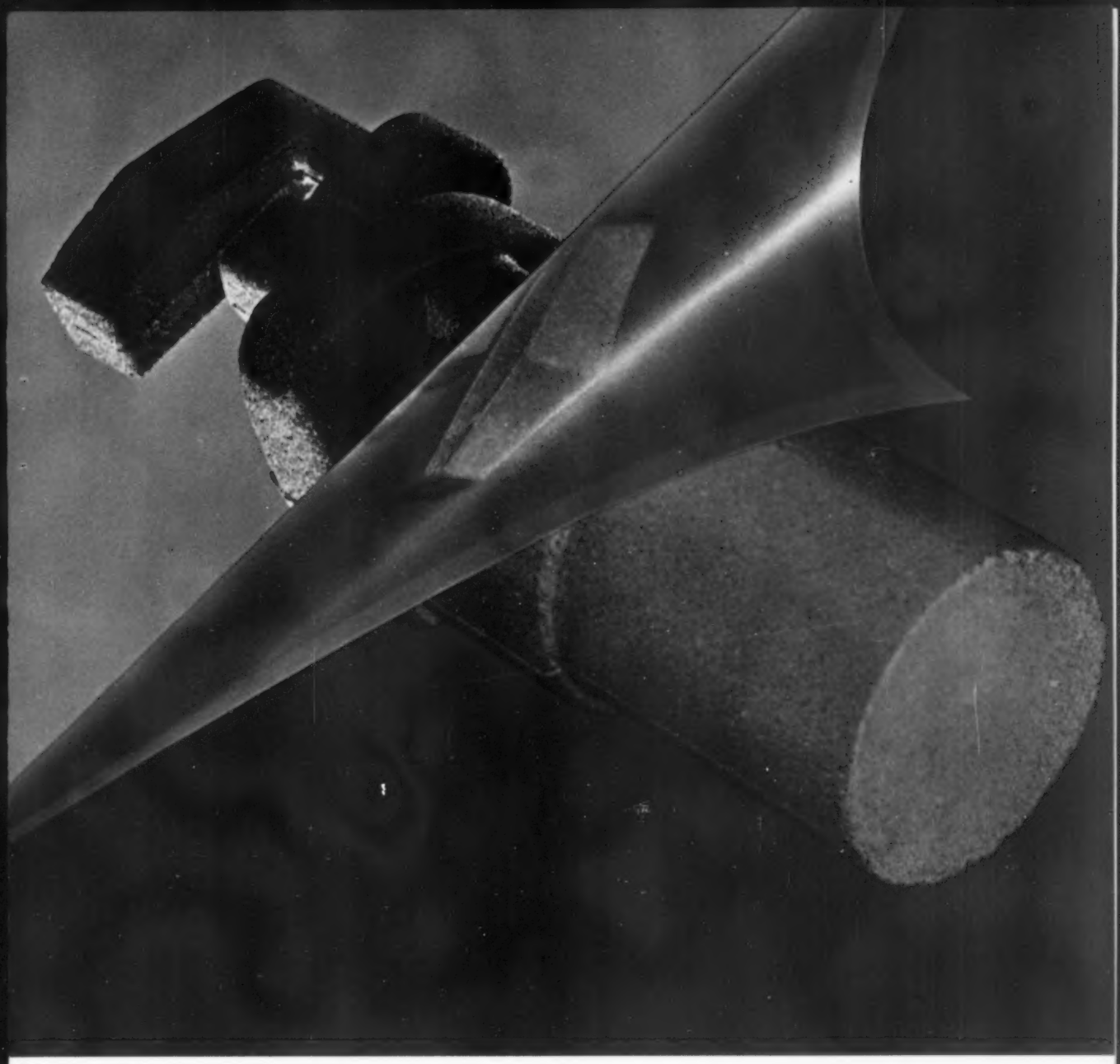
Circle 586, Page 39→



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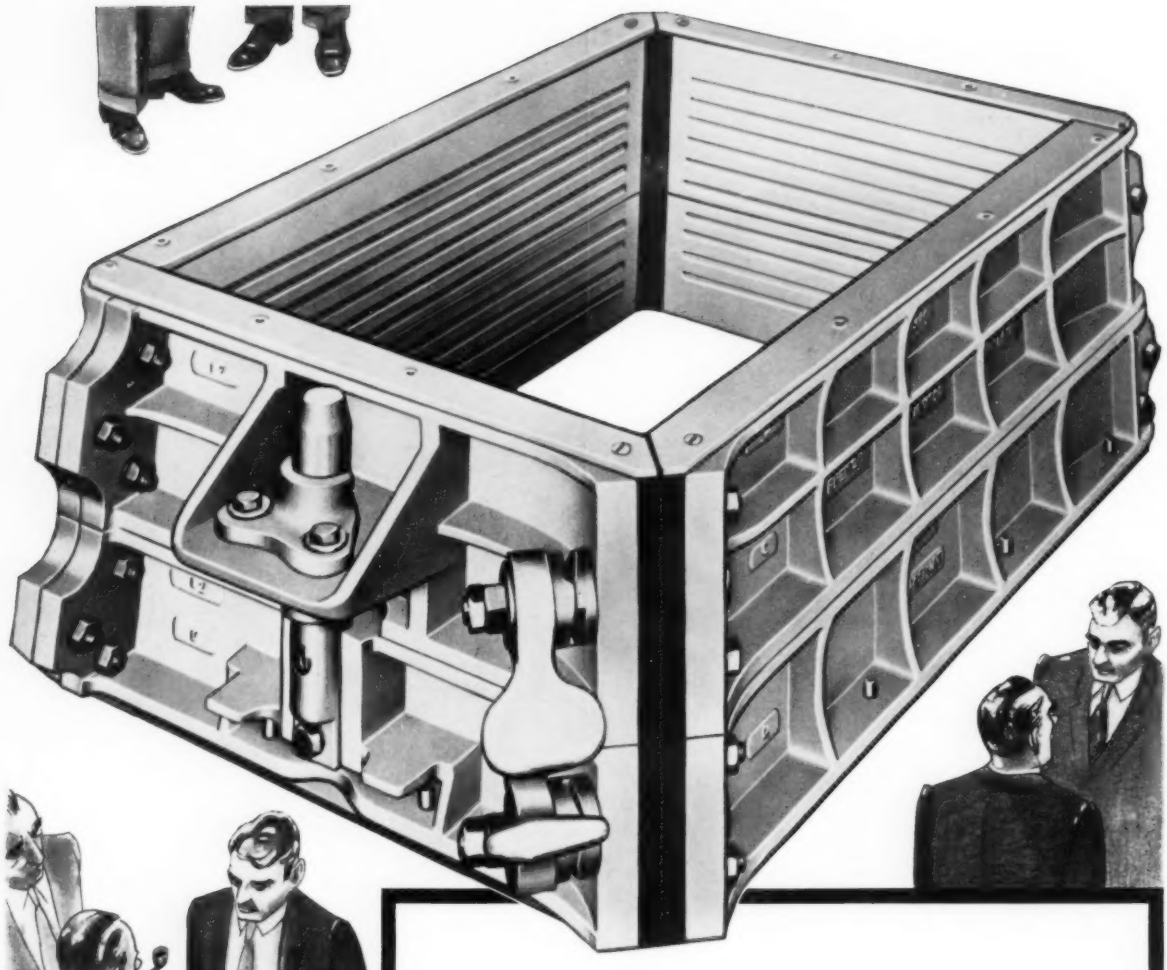


One foundryman tells another:

"FREMONT MAGNESIUM FLASKS....."

"Well, they've had 30 years magnesium experience . . ."

"Oh, yes . . . a full line of sizes . . ."

"They're very dependable . . ."

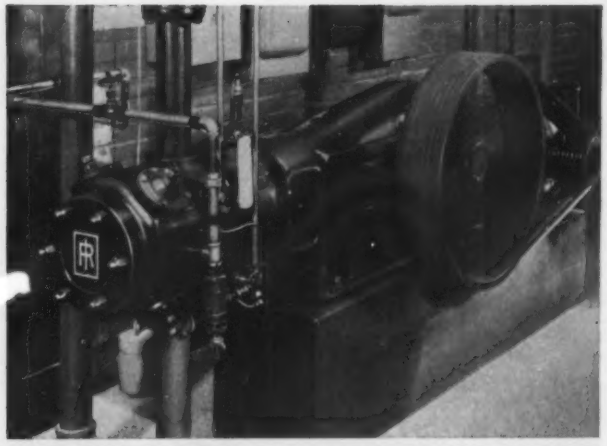
"Let's check their prices before we order magnesium flasks anywhere!"

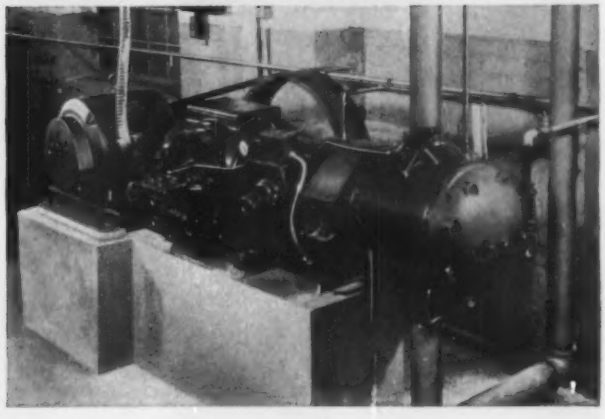
"Write for literature and prices."

The Fremont Flask Co., Fremont, O.

For More Information Circle 587, Page 39

Top: this 20-hp Ingersoll-Rand ES air compressor has served the G. E. Prentice Manufacturing Company for 12 years with no part replacements. Bottom: new 25-hp ESH compressor, added for increased capacity.





IN I-R COMPRESSORS,

TIME TELLS

THE DIFFERENCE

12 years as full-load compressor...

43,560 HOURS

with no parts replaced!

In 1947, the G. E. Prentice Manufacturing Company of Kensington, Conn., installed an Ingersoll-Rand ES compressor to supply the air power for production of metal stampings. Since then, the compressor has been on duty through every shift, and has totalled more than 43,560 hours with no part replacements on valves, cylinder, or running gear!

The Channel Valves were inspected twice a year and cleaned when necessary, but no parts were replaced. The cylinder bore and rings are still in perfect condition.

Recently, a new Ingersoll-Rand ESH compressor was added to take care of increased capacity demand. The ESH is the successor to the ES, and offers many new *extra-value* features, such as full-floating aluminum bearings which never need adjustment, sealed frame which keeps out dirt (the major cause of wear), complete filtered pressure lubrication, and self-adjusting metallic packing. And of course, Ingersoll-Rand's famous air-cushioned Channel Valves with reversible seat plates.

Ingersoll-Rand offers the most complete line of compressors, in reciprocating, centrifugal, rotary and ejector types. There are units from ½ to 20,000 hp, for pressures from one micron to 35,000 psi. Your I-R man can give valuable help with your compression needs – call him today.

Ingersoll-Rand

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The World's Most Comprehensive Compressor Experience

For More Information Circle 588, Page 39

Are You getting the advantages of 'GROUND-TO-GRINDING' QUALITY CONTROL?

In cutting action, wheel life and production economies, Simonds grinding wheels give you top value. The reason? Control . . . complete quality control starting with abrasive grain manufactured by Simonds Canada Abrasive Co. Ltd. . . . single-management quality control extending to the finished wheels . . . single-source quality control backed by our technical engineering service . . . in short, ground-to-grinding control that gives Simonds wheels that *extra* efficiency to give your products *extra* value. New illustrated catalog gives the specific advantages. Write for copy on your letterhead.

SIMONDS ABRASIVE CO.
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your "buy-pass" to better grinding
CALL YOUR SIMONDS DISTRIBUTOR
helping YOUR business is HIS business

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TRAMP TRAMP TRAMP

Model S-522-9M, one of 3 Royer Scrap Control Units

Tramp iron drops out of the picture when you install a Royer Scrap Control Unit. If you're looking for immediate savings in your foundry operations by eliminating tramp iron damage to equipment, castings *and profit*, here's a small investment with a big payoff.

Royer Scrap Controls clean up to 60 tons of shake-out sand an hour. Because they're portable and require no pit, they'll fit your mechanization plans and give production line efficiency.

Send for Bulletin SC-61. It gives the facts and specs on the Model 522 shown and tells you about other foundry units. Royer manufactures a complete line of sand conditioning units to fit any size foundry. Contact us at 159 Pringle Street, Kingston, Penna., phone BUtler 7-2165.

ROYER FOUNDRY & MACHINE CO.

ROYER

For More Information Circle 590, Page 39

Knight LETTER

SEVENTH IN A SERIES

To: Foundry Management

Subject: Meeting Competition

The future holds many opportunities and problems for the foundry industry. New technology and new metallurgy offer greater penetration of old markets and development of applications in new markets by providing a finished component to perform the desired function at lowest cost.

To take full advantage of these opportunities all foundrymen should–

1. Improve sales engineering to perform a service and minimize selling metal at so much per pound.
2. Fully utilize present manpower and facilities.
3. Develop plans to modernize facilities and methods, streamline organization and procedures.

Knight organization engineers are specialists in foundry problems, having successfully completed more than 1000 varied foundry assignments in 21 countries. Key men of the Knight organization have 10 to 30, or more, years of successful experience in foundry management, production, plant layout or equipment.

Call on Knight specialists to audit your operations and assist you to plan for the future, meet competition and maintain adequate profitability.

KNIGHT SERVICES INCLUDE:

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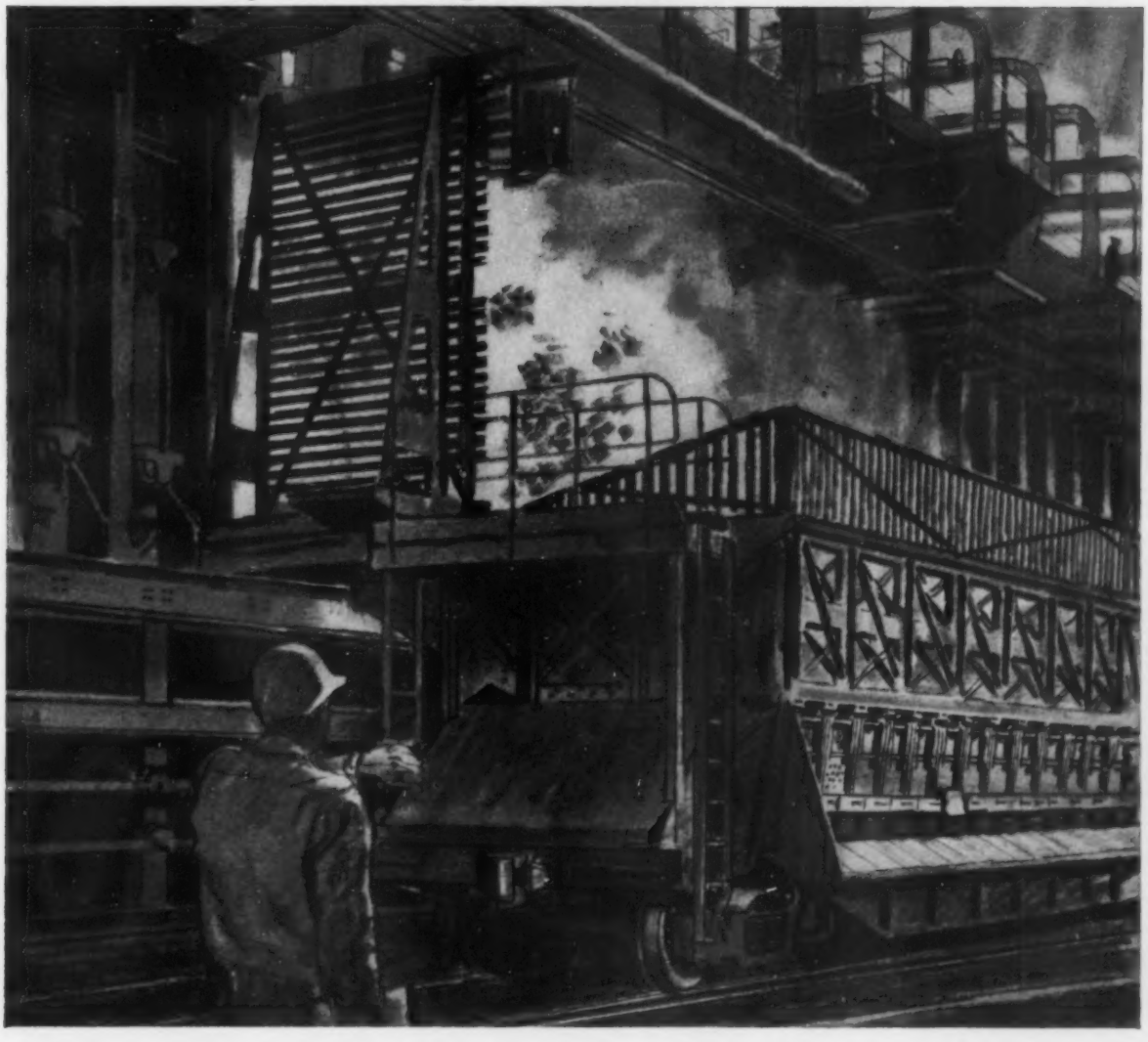
Birth of a Gray Iron Casting—No. 4



PRODUCTION OF FOUNDRY COKE

A 15-ton slab of fiery, red hot coke, crumbling and cascading into a quenching car is one of industry's most spectacular events. The coke push is one of the final steps in coke production . . . a process that works with ton-weights, yet demands the precision control normally associated with metric ounces.

In Neville Foundry Coke production carefully selected coals containing a high percentage of Pocahontas, are washed, blended and transported by conveyor belts to storage bins above the coke ovens.

Each charge is weighed so that approximately 18 tons of blended coals are placed into each oven. All openings are then sealed and the blend is "coked" under closely controlled conditions for an exact period of time. A fifty-foot ram pushes the fired coke from the oven into quenching cars. The cars are then moved under the quenching tower where 10,000 gallons of water are sprayed onto the coke to prevent it from consuming itself. Sizing and grading are the final steps in the production process.

The end result is Neville Foundry Coke—a hard, dense product, high in carbon content, low in ash and sulphur . . . "tailor-made" for the production of high quality gray iron castings.

COKE & IRON DIVISION
PITTSBURGH
COKE & CHEMICAL CO.
GRANT BUILDING PITTSBURGH 19, PA.

Neville Pig Iron and Neville Coke for the Foundry Trade

For More Information Circle 592, Page 39

Built for You in
Any Length, Width or Depth

ADAMS ALUMINUM EASY-OFF FLASK

Make real savings from these advantages!

RIGID CONSTRUCTION from our proven corner design, permits less weight with no loss of strength.

SOLID CORNERS are of the same design used on Adams Aluminum Slip Flasks. This interlocking tongue-and-groove construction is retained in perfect alignment with bolts secured through tapped end sections and locked with washers and nuts. Important! This construction has proved far superior to other forms of corner design.

MALLEABLE TRIMMINGS are used on Adams Aluminum Easy-Off Flasks as on all other flasks we manufacture.

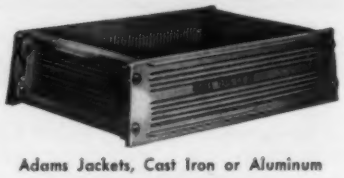
OPERATING MECHANISMS are identical with those used on the Adams Cherry Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

STEEL PROTECTING STRIPS are standard equipment at top of cope and bottom of drag. Aluminum strips available upon request at no extra charge.

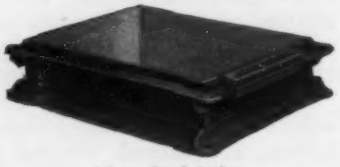
HANDLES AND TRUNNIONS are available when specified.

PIN AND EAR ARRANGEMENT available to interchange with present pattern plate guides.

Adams Cherry Easy-Off Flask



Adams Jackets, Cast Iron or Aluminum



Adams Steel Jacket

Write us today for further details . . . Cherry Snap Flasks—Cherry Slip Flasks—Aluminum Slip Flasks—Easy-Off Flasks—Cherry Presser Boards—Wood Bottom Boards—Steel Bottom Plates—Steel Jackets—Aluminum or Cast Iron Jackets—Steel Bands—Steel Upsets—Cherry or Aluminum Upsets

The ADAMS Company

ESTABLISHED 1853

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

When it's TOO HOT for ordinary washes ...use VELVALITE ZA-2

Pouring steel at 3000 degrees or more? One wash stands up against it—VELVALITE ZA-2. The "Z" stands for Zircon—a refractory that won't erode or burn away, even inside heavy sections, gates, sprues and runners. Alcohol is the suspension agent, permitting air dry or feather torching on resin bonded, shell, air-cured, and other no-bake cores.

Two other ADM VELVA washes are making history for their superior performance:

VELVAWASH MW-2, a mica-graphite refractory wash, water-borne, that withstands the hottest grey-iron pouring temperatures you'll encounter.

VELVALITE GA-2 resists grey-iron or semi-steel pouring temperatures up to about 2800 degrees. Unusual suspension characteristics are obtained in this combination of graphite and alcohol, as well as durability, and your choice of air drying or light-off.

Use any application technique on all three VELVA washes. They resist streaking, shrinking or cracking, smooth up porous surfaces, fill imperfections, and lay tight to the sand. All in all, these VELVA washes are a real bargain. They give better "mileage"—more gallons per lb. of dry wash.

Why the name VELVA? Because castings come out with velvet-smooth finishes ready to please your toughest customer. Contact your ADM-MAN today.

Write for your copy of ADM's Core Wash Specification Chart

Archer QUALITY

Archer-Daniels-Midland

FEDERAL FOUNDRY SUPPLY DIVISION

2191 West 110th Street Cleveland 2, Ohio

For More Information Circle 594, Page 39

THE LITHIUM REACTOR

CURRENT INFORMATION ON LITHIUM CHEMISTRY AND METALLURGY

HOW LITHIUM IS HELPING EXPAND MODERN METALLURGY

Discovered in 1817, and isolated in metallic form a year later, lithium has achieved prominent use in the metallurgical field only in comparatively recent years, as modern technology has demanded new materials with unusual properties and better performance. The first important application of lithium in metals came in 1918, when it was employed in Germany as an alloying element in Scleron, an aluminum-zinc alloy in which small amounts of lithium were used to improve the characteristics of the base metal and impart greater strength, toughness and hardness.

Starting in the late 1930's, lithium came into use in the degasification of copper castings. At first, a "lithium-copper alloy" was employed, then lithium cartridges — thin walled cylinders of pure copper containing specific weights of metallic lithium. Lithium is now widely used in producing copper free from oxygen and other gases. Approximately 50,000,000 lbs of nonferrous castings were made by this method in 1955 and the practice is growing.

Serious study of other metallurgical applications of lithium has resulted in a number of developments. Lithium is now being used in the manufacture of self-fluxing alloys for brazing of alloy steels, where it effectively removes any oxides. Lithium also can, under controlled conditions, eliminate the need for fluxes, and in some cases, the use of inert atmospheres as well.

Metals For the Space Age

The present demand for beryllium, titanium, zirconium, thorium and molybdenum — has led to advances in the electrowinning and electrorefining processes for these metals. Lithium salts, when added to the fused salt baths, provide lower-melting mixtures.

Other recent applications of lithium include the development of high-strength lithium-aluminum alloys for the skins of supersonic aircraft, and a lithium-magnesium alloy which shows excellent promise for light-weight armor plate.

To date, only a limited range of lithium's properties as an alloying element have been explored. As further data are assembled, it is expected that other lithium-bearing alloys will be developed for specific uses.

LITHIUM IN BRIEF

New developments involving lithium are constantly appearing in the literature. Each month some will be mentioned here briefly.

•

A discussion of the electrolytic preparation of rare earth metals notes that certain cerium salts can be electrolyzed in KCl-LiCl and CaF_2-LiF eutectics. Lithium is the reductant for preparation of most rare earths from their fluorides, and has little tendency to alloy with them. (4033)

•

A study by the AEC reports on the physical and mechanical properties of some aluminum-lithium alloys. High temperature properties are determined for some compositions. (4073)

•

Investigations into the phase equilibria of systems involving alkali and alkaline-earth metals reveal data on lithium-strontium and lithium-calcium systems. (4077)

•

A recent patent covers the heat-treatment of magnesium-lithium alloys in hydriding atmospheres for conversion of the lithium to lithium hydride and improvement of the alloys' high temperature strength. (4135)

•

A new ferromagnetic material has the empirical formula $LiFe_2O_3F$. (4155)

•

A study of nuclear magnetic resonance intensities in alloys shows that nuclear quadripole effects are prominent in the steady-state magnetic resonances of lithium-magnesium alloys. (4239)

•

Studies of thermal conductivity of aluminum-lithium alloys show that lithium additions decrease thermal conductivity in a non-uniform manner, with the greatest decrease occurring during the first 2% addition. (4298)

A lithium air-proof brazing alloy was used in construction of the B-58 Hustler, newest bomber of the Strategic Air Command.

BRAZING ALLOYS WITH LITHIUM PROVIDE FASTER, MORE RELIABLE METAL BONDING

With the general trend toward more reliable, less complex methods of joining metals, much research has been performed to develop brazing alloys that can be used for brazing in air without need for additional fluxes or inert atmospheres.

A "self-fluxing, airproof brazing alloy" would simplify brazing production procedures and eliminate the need for external fluxes that may become trapped in the joint.

The alloys that exhibit the most promise in fulfilling this objective contain lithium as an active ingredient. Lithium has a strong reducing action that enables it to protect the surface of the base metal from oxidation and allow the brazing alloy to wet the metal for complete joint penetration.

When combined in the brazing alloy formulation with another reducing element such as boron, the following desirable properties are obtained: (1) An extremely active composition whose ingredients have high affinity for oxygen; (2) Formation of a low-melting protective eutectic of the oxides of lithium and boron when the joint is heated; (3) Excellent fluxing powers and the ability to put even refractory oxides into solution.

Work is now going forward to develop brazing alloys that will incorporate the above characteristics and also possess high corrosion resistance and good homogeneity.

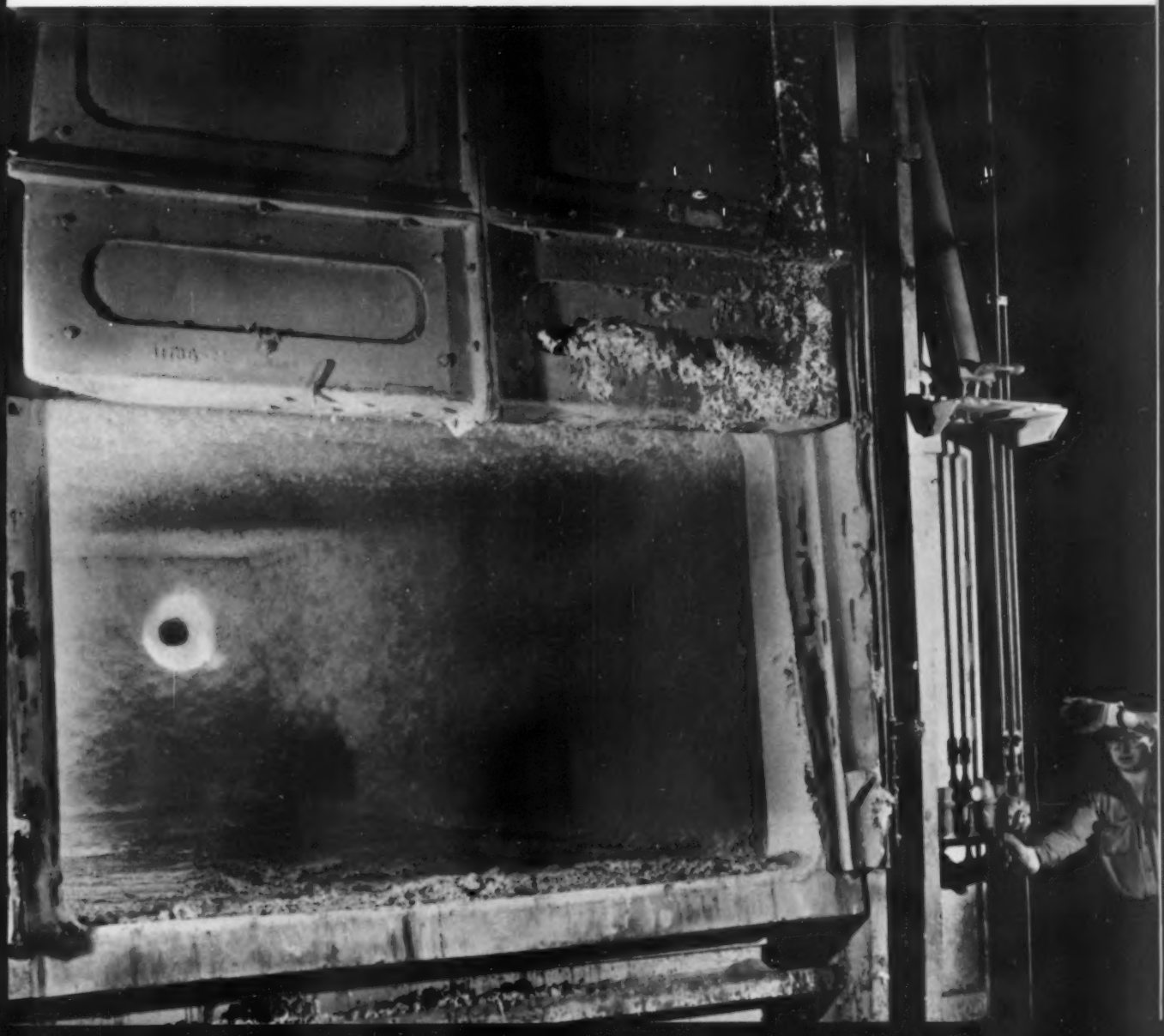
LITHIUM CORPORATION OF AMERICA, INC.
500 FIFTH AVENUE • NEW YORK 36, N. Y.
NEW YORK 36, N. Y. • CLEVELAND 14, OHIO • CHICAGO 1, ILL. • LOS ANGELES 36, CALIF. • BESSEMER CITY, N. C.

For More Information Circle 595, Page 39

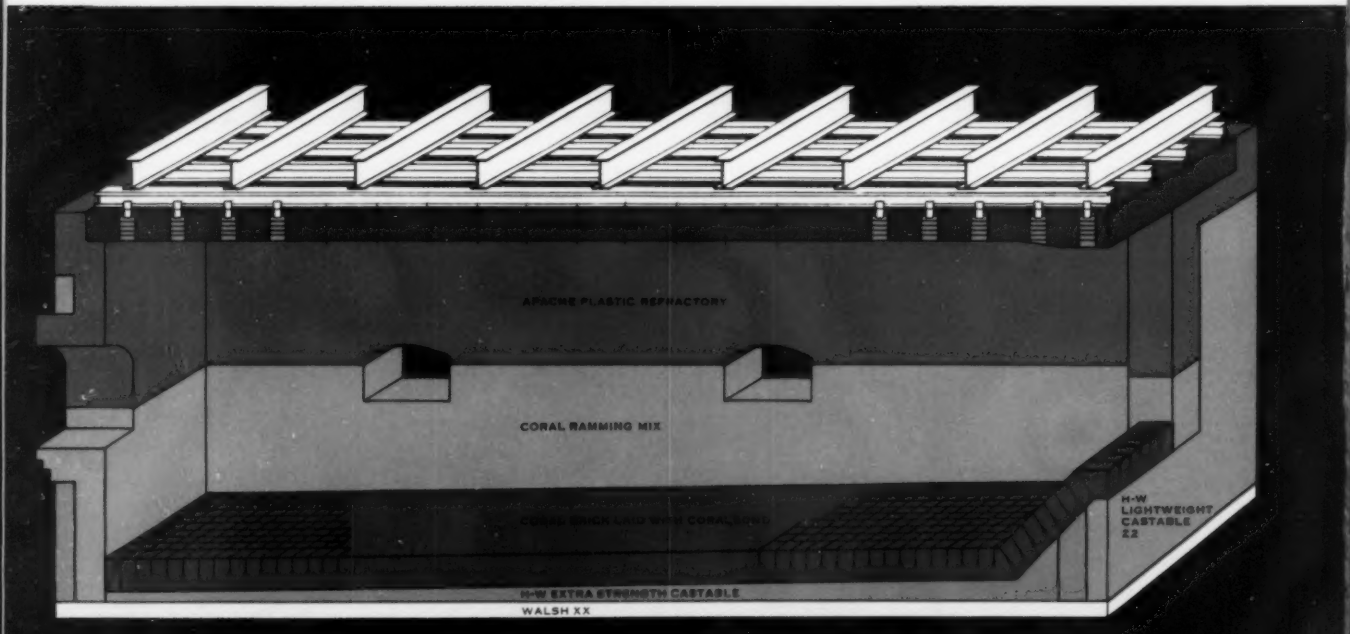
Circle 596, Page 39→

THIS HIGHLY SUCCESSFUL ALUMINUM MELTING FURNACE FEATURING MONOLITHIC CONSTRUCTION WAS BUILT ENTIRELY OF HARBISON - WALKER REFRACTORIES.

Construction and product details are given on the following page. PHOTO: COURTESY OLIN-MATHIESON CHEMICAL CORPORATION



CORAL BRICK, CORALBOND AND CORAL RAMMING MIX WERE ESPECIALLY DEVELOPED BY HARBISON-WALKER FOR ALUMINUM MELTING FURNACES. THEY HAVE ALREADY DEMONSTRATED UNUSUAL RESISTANCE TO PENETRATION AND CORROSION BY ALUMINUM ALLOY REACTION . . . AS WELL AS TO THERMAL SHOCK, SPALLING CONDITIONS, AND SEVERE IMPACT AND ABRASION. THE REFRACTORY USED IN EACH FURNACE SECTION WAS SELECTED TO ASSURE THE BEST BALANCED SERVICE LIFE.



WALSH XX

A strong, power pressed, high duty fireclay brick.

H-W EXTRA STRENGTH CASTABLE

A refractory concrete of outstanding physical strength.

CORAL brick, laid with CORALBOND

These specialized high-alumina brick and mortar have exceptional high strength to withstand spalling and slagging influences and provide remarkable resistance to molten metal reaction.

CORAL RAMMING MIX

This companion product to CORAL brick and CORALBOND, installed by gunning or ramming, has excellent resistance to molten aluminum alloys and develops great strength at operating temperatures.

H-W LIGHTWEIGHT CASTABLE 22

An insulating monolith.

APACHE PLASTIC REFRACTORY

A high alumina (60%) monolith with refractoriness equal to brick of this class but with much lower permeability.

H-W SUPER PLASTIC

A monolith with very good workability and refractoriness equal to superduty brick.

WRITE FOR DATA — Complete product descriptions and test data are available showing the superior resistance of these refractories to aluminum alloy reaction.

HARBISON-WALKER REFRACTORIES COMPANY AND SUBSIDIARIES

GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

World's Most Complete Refractories Service

HW 61-7

Convention Impressions

Anyone who attended more than an occasional technical session at the AFS Congress in San Francisco probably came away with these impressions:

- The extent of what we don't know about foundry materials and practices is infinite. Speaker after speaker pointed to the need for further study of subjects under discussion, and almost every investigation seems to have raised as many new questions as it solved.
- Too little money is being spent on research. This fact is indicated by the limited extent of studies reported—a situation which will continue until foundries collectively realize the necessity of financing an adequate program to insure their being in business 20 years from now.
- Many foundries aren't making use of what technical knowledge is available. Authors of two papers described how their foundries had improved product quality substantially in recent years, but their methods won't interest foundries looking for panaceas or so-called "breakthroughs." All that is involved is careful and systematic control of each process which can cause a casting defect, plus the determination of management and supervisors to carry out the program. Other foundries can do the same if they are so minded.
- There is more interest or development work in light metals, diecastings, and permanent mold castings than in gray iron or malleable iron. In contrast to the 6 papers presented on gray iron and 4 on malleable, there were 11 discussions of metal mold practice and 14 of aluminum and magnesium casting operations. Surprisingly, 19 papers were offered at sessions of the Steel Division.
- Recent technical progress has developed nothing startlingly new. Probably the most widespread attention has been attracted by the furan sand binders which made their debut a year ago.
- Foundrymen generally are willing to share their knowledge. This historical exchange of know-how is one reason why technical progress of the industry will continue. But it could and should be accelerated.

William G. Reese
Editor

A New Concept of

Mechanized Castings Production

Simplified systems of speedy, versatile foundry equipment are key factors in a concept of planning castings production on the basis of the existing imbalance of cast parts inventory

By ROBERT H. HERRMANN
Associate Editor

● MASS PRODUCTION of castings is as much a concept of planning as it is of equipment installation. Also, mass production in foundries does not necessarily mean the repetitive production of identical units. More appropriately it is the adaptation and utilization of mechanized equipment for the steady, balanced output of variously-shaped castings.

These are the thoughts of Theodore R. Schroeder, foundry superintendent, Pontiac Motor Div., General Motors Corp.

Casting production at Pontiac is governed by the imbalance in inventory of the 32 different automotive cast parts made at the foundry. The scheduling of patterns is a constant effort to keep the inventory in balance, and the balancing-out cycle at Pontiac takes about two weeks. That cycle can vary up to a maximum of 60 days, in Mr. Schroeder's opinion, for different foundries and different types of castings.

The control of defective castings produced is very important in that concept of scheduling. The scrap rate should be about the same for all castings produced. However, the rate for smaller castings can be slightly greater because production recovery of smaller castings is easier than for large ones by more frequent scheduling of insert-patterns made by the cast-to-size method.

Elements of Scheduling—The elements of production scheduling are day-by-day knowledge of inventory imbalance and the scheduling of patterns to achieve inventory balance. Two important, additional factors affect scheduling of the proper number of castings. They are the cycle time of the pattern on the molding line and the scrap rate of the particular casting.

The engine block line installed in 1954 was the first highly mechanized system installed in the foundry. The most recent mechanized line was completed in December, 1960. During that interim when old lines were being replaced by mechanized systems the need for proper and extensive training of maintenance men and maintenance supervisors was recognized.

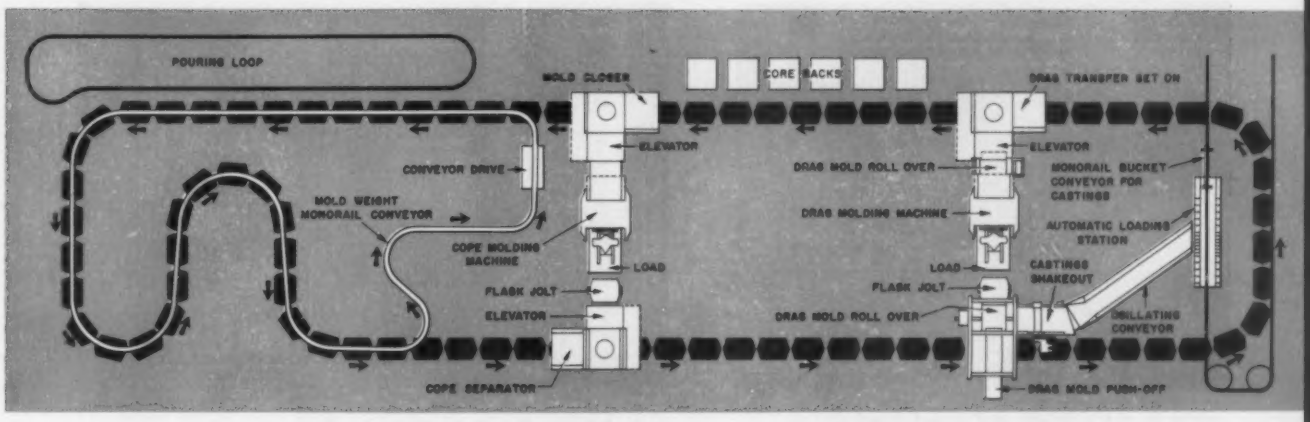
A specialized maintenance group consisting of an electrician, a millwright, a pipe fitter, a welder, and a machine repairman was developed for each mechanized line—a task force that could take over a new line and de-bug it. This group was part of the crew that installed each new line in close co-operation with equipment manufacturers to learn all details of the line. The group then is responsible for all subsequent maintenance of the line until additional personnel can be trained.

Pontiac now has six mechanized molding lines and seven sets (cope and drag) of molding machines. Only one of these lines is not completely mechanized. Formerly the foundry incorporated eight lines and 32 sets of machines. Yet, casting production capacity today is greater than it was previously.

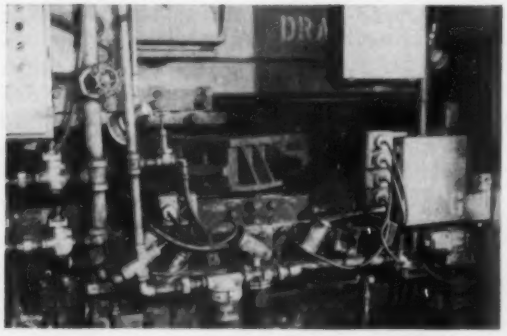
Changing Ideas—Improvements in speed, accuracy, and reliability of mold making and handling equipment and in the preparation and distribution of molding sand are important factors in this changing concept of casting production. Because of the increased speed of automatic molding machines, for instance, one pair of cope and drag units can provide the quantity of molds formerly obtained in a battery of older cope and drag machines.

Furthermore, a change downward in production volume on the newer lines incorporating one pair of cope and drag units can be accomplished economically simply by changing pattern inserts more often and keeping the mold rate the same. Here again, scheduling played the top role in having the proper castings at the proper time. On former lines incorporating a battery of machines, the change was accomplished by shutting down one or two pairs of machines. The situation of having idle molding machines when the rest of the equipment, such as sand system, shakeout, and mold conveyors, is running, makes a costly operation by not fully utilizing equipment that must be maintained.

Also, in Mr. Schroeder's opinion, the new concept of mass production obsoletes the operation in an automotive foundry of a molding line for a particular part such as blocks, heads, manifolds, or flywheels. The



Floor plan drawing of the most recent mechanized Pontiac molding line



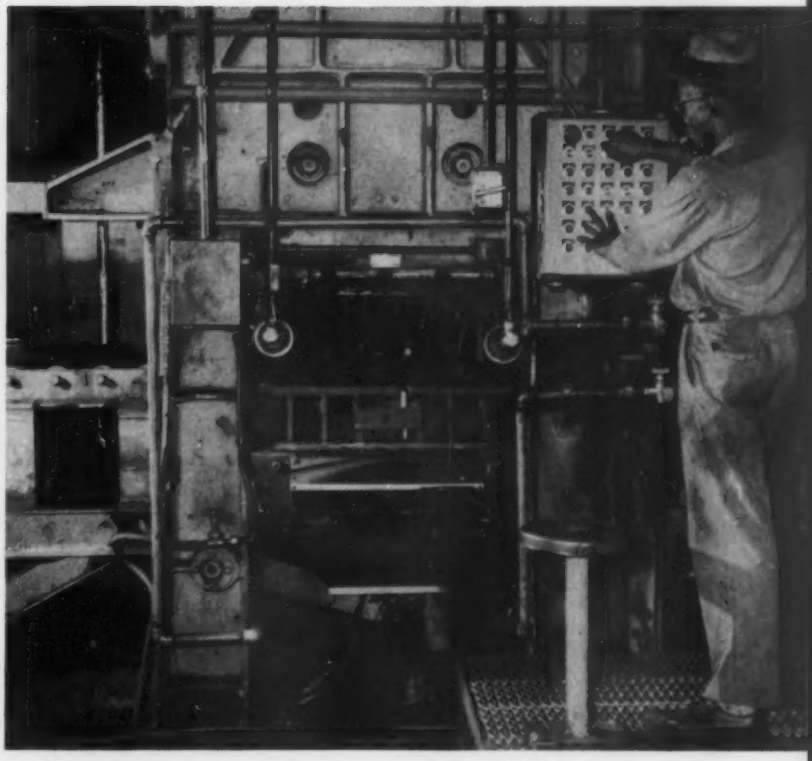
Flask is turned horizontally 180 degrees when it enters molding machine because it has an elongated bushing at one end which must be properly located in the machine

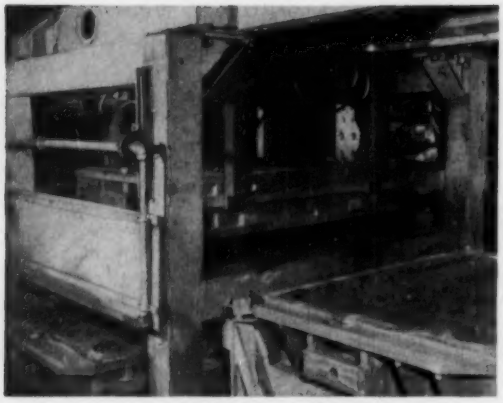
Drag mold machine operator has the machine held in position just before squeezing the mold. Note how sand has been struck off to leave small mounds between flask bars

use of segmented pattern plates with quick-change inserts provides versatility of operation on a line that is as efficient as a specialized line. Adaptability to the production of varied castings is important in the balanced inventory concept of production planning.

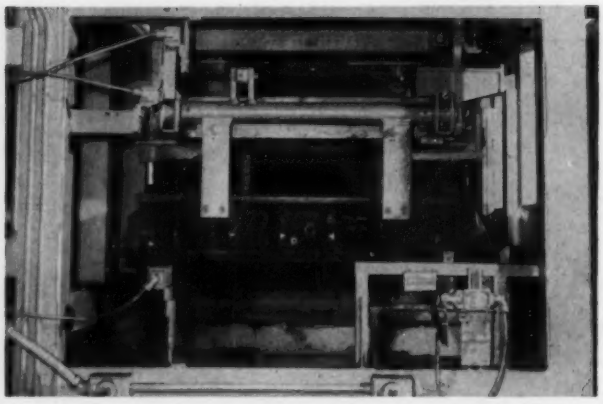
Inserts in the segmented pattern plates used on the newest Pontiac foundry line can be changed in 7 to 15 minutes. Changes usually are made during lunch time or relief periods. This line produces 32 different parts ranging from heads, if necessary, to bearing caps. Blocks and heads, however, generally are made on other lines because those lines, when installed, were designed for production of those parts.

Simplicity Is Important — Mr. Schroeder also believes that simplicity is an essential ingredient in foundry mechanization. Unnecessary equipment should not be installed. Only that required to do an efficient high production job should be used. Unnecessary changes of direction of work in process should be avoided.





View of drag set-off unit shows mold at right on elevator ready to be raised to the setting head. Center mold is in the head ready to be set on conveyor car. Mold at left is on a car



Clamps of the setting head hold cope in the mold-closing machine ready for lowering on drag as it passes underneath on the car conveyor. Dart locating pins on ends of cope align it on the drag

Straight through flow of flasks from one side of the line to the other, completing shakeout, mold making and setting, avoids idle flasks and directional change of the flasks.

These things have been achieved on the new line. The line is a car conveyor loop with separate cope and drag lines crossing the loop with no zigs or zags.

The reduced amount of handling and consequent slower movement of flasks are important factors in flask life and accuracy. On the basis of observations to date, the life of flasks is expected to be increased one to five years. This new line is operated at a conveyor speed of 240 cars an hour. However, the machine is capable of producing 275 molds an hour.

How the Line Works—The production cycle begins with an air cylinder pushing the drag flask, containing the hot castings and sand, off a car of the conveyor to a double end rollover. The rollover is S shaped and brings the flask to a lower level in a 180-degree turn. As the flask is turned over, sand and castings fall to a below-floor-level vibrating shakeout which feeds castings to an oscillating conveyor.

An air cylinder pushes the inverted flask from the rollover to a jolt shakeout. That flask is pushed by a succeeding flask to a rotating device which raises the flask from the rollers, turns it 180 degrees in a horizontal plane and sets it back on the rollers. The flask must be turned because it has a round bushing at one end and a squared bushing at the other to insure correct placement of the flask on the pat-

Monorail chain conveyor lowers weights to molds just prior to pouring

tern pins without sticking or hanging up and the matching of the cope and drag molds.

The turned flask is grabbed by an air clamp on a shuttle car and moved along a wheel conveyor to a point over the pattern plate. The flask then is lowered, over locating pins, to the pattern. Sand from a hopper on the shuttle car is dropped into the flask. The shuttle then returns to pick up the next flask, and, in doing so, strikes excess sand off the mold.

During the backward movement of the shuttle, the molding machine is jolting. The jolting action causes the strike-off-bar to leave small mounds of sand between the flask bars. When the shuttle car is in the back position, the squeeze head, mounted on the front part of the shuttle, is in position. After the squeeze, the drag mold is stripped from the pattern and rests on the wheel conveyor. As the shuttle brings in the next empty flask the finished drag mold is pushed out of the molding machine and rolls by gravity into the rollover machine which turns it upside down. It is nudged out of the rollover to an elevator.

The head of a mold-setting machine moves over the drag mold. The elevator raises the drag between four clamps on the setting machine head. They grab the mold, and the elevator lowers, allowing the mold to be moved over the conveyor. A passing conveyor car triggers the setting machine, which follows the conveyor, clamping onto the car. The mold is lowered to the car.

Workers set cores in the drag as the conveyor carries it to the cope closing machine.

Copes are made in a manner similar to the making of drags. The main difference is in the fact that the cope is not rolled over to remove the used sand.

Cope flasks are lifted off the poured, cooled molds by a machine similar to the drag and cope mold setting machines. The head of this cope flask strip machine moves a flask over an elevator which raises under the cope mold, allowing the cope strip machine head to release the mold and return for the next one. The elevator lowers the mold to the level of a jolt shakeout. As the next cope is brought over, it pushes the one on the elevator into the jolt shakeout. The flask on the jolt shakeout is pushed into the molding machine, which cycles the flask through in the same manner as the drag.

Air Jet Reams Sprue—On leaving the molding machine, the cope goes into an idle station under an exhaust hood where the sprue cup is cleaned by a corkscrew jet of air which reams out the sand flash usually present where the sprue post enters the cup. Exhaust air from the molding machine is used for this purpose.

The completed cope is pushed to an elevator and raised to the clamps of a shuttle car on the cope setter which carries the cope into the closing machine. This machine has its own air-cylinder-raised and lowered guide pins. In addition, the drag is aligned on the conveyor car by air clamps as it enters the closing machine.

Weights, carried by an overhead monorail chain conveyor, are lowered to the molds where the monorail dips over the car conveyor. The chain conveyor is powered by the same unit which drives the car conveyor. Consequently, both travel at the same speed, permitting accurate placement of the weights on molds.

Castings previously dumped to the floor-level shakeout are carried above the first floor level by an inclined oscillating conveyor and dumped into baskets suspended from a monorail chain conveyor. As the baskets approach the discharge end of the casting oscillating conveyor, the monorail dips to set the baskets on a double section of roller conveyor.

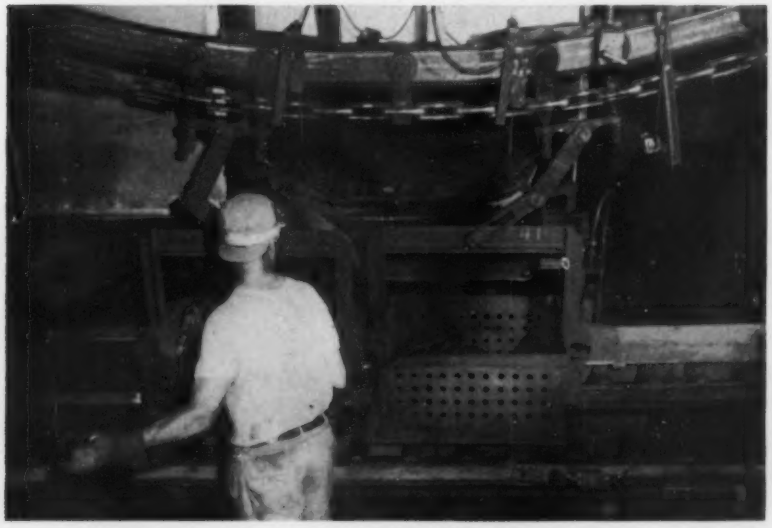
An air cylinder pushes each basket ahead about 3 ft on the roller conveyor to the end of the oscillating conveyor. Because the baskets are attached to the monorail conveyor chain by a triple-linked arm a momentary pause is provided before the chain carries the baskets away. This pause is sufficient for the baskets to receive their load of castings from the oscillating conveyor.

Sand from shakeout points is screened and carried back to storage for subsequent mixing and distribution back to the molding machines.

Core Handling—At present, oil-bonded sand cores are being used in the molds on this line. They are trucked on racks from the coreroom and placed along the car conveyor loop. Core setters unload cores from the rack into the molds.

Plans for the near future are that hot box cores will be produced in the center of the molding loop and set immediately in the molds with a minimum of handling and transportation.

Worker steers castings coming from the oscillating conveyor into baskets suspended from the overhead monorail chain conveyor. Triple-linked arms provide a momentary pause for the baskets on the roller conveyor



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AFS Meets for 65th Castings Congress

Lobby of the Sheraton-Palace Hotel, headquarters of the 1961 convention

ALBERT L. HUNT
. . . president

JOHN A. WAGNER
. . . vice president

● ALTHOUGH attendance at the 65th Castings Congress of the American Foundrymen's Society was somewhat disappointing, foundrymen present were provided an extensive and well conducted program of technical discussions. The annual convention was held at the Sheraton-Palace Hotel, San Francisco, May 8-12.

Total registration for both the men's and ladies' programs was announced as 1644.

Plant inspections proved popular for the visitors, particularly the trip to Mare Island Naval Shipyard which attracted a capacity group.

Technical sessions disclosed additional progress in various aspects of foundry practices and products but no radically new developments.

Annual Business Meeting—Some of the high lights of the society's recent activities were reviewed by AFS President Norman J. Dunbeck, vice president, International Minerals & Chemical Corp., Skokie, Ill., in addressing the annual business meeting.

Society membership now is 12,700, and the list of chapters totals 47, of which 14 are student chapters. The first student chapter in Canada recently was established at Ryerson Institute of Technology, Toronto.

Courses conducted by the Training and Research Institute continue popular. The 60 courses held to date have attracted an attendance of about 1800 persons from 700 companies.

President Dunbeck said that because of constantly increasing expenses, the society has found it necessary to increase dues for the first time since 1953. July 1 will be the effective date.

William W. Maloney, general manager, announced the election of officers and seven new directors.

Albert L. Hunt, AFS vice president the past year, succeeds Mr. Dunbeck as president for 1961-62. At present executive vice president of Superior Foundry Inc., Cleveland, Mr. Hunt previously was vice president in charge of operations, National Bearing Div., American Brake Shoe Co., St. Louis.

John A. Wagner, new vice president of AFS, is president of Wagner Castings Co., Decatur, Ill. He joined that company in 1919 and served as production manager and vice president before being made president in 1934. Mr. Wagner is a past president of the Malleable Founders Society.

The following were named to three-year terms as directors:

Daniel E. Best, superintendent, brass and iron foundries, Bethlehem Steel Co., Bethlehem, Pa. He joined Bethlehem in 1932 and was brass foundry superintendent before assuming his present position in 1958.

Roger J. Hageboeck, vice president and foundry manager, Frank Foundries Corp., Moline, Ill. His previous industrial affiliations included Grede Foundries Inc., Waukesha, Wis., Lincoln Foundry Corp., Los Angeles, and Electron Corp., Littleton, Colo.

Dale L. Hall, works manager, Oklahoma Steel Castings Co., Tulsa, Okla. Joining the company as chemist in 1936, he later was chief metallurgist, works manager, and was named works manager in 1949.

C. J. Lonnee, president, Alloyed Grairon Castings Corp., Ravenna,

Norman J. Dunbeck, retiring president, reviewed society activities at the annual business meeting

NEW AFS DIRECTORS

CHARLES H. OSSENFORT

MARVIN E. NEVINS

DALE L. HALL

Mich. Beginning his foundry career in 1919 with the Barber Co., Sparta, Mich., he subsequently became general superintendent, Sparta Foundry Co., Sparta, Mich.; general manager, Clover Foundry Co., Muskegon, Mich., and took his present position in 1951.

Marvin E. Nevins, president, Wisconsin Centrifugal Foundry Inc., Waukesha, Wis. At one time foundry superintendent, Ampco Metal Inc., Milwaukee, he formed Wisconsin Centrifugal Foundry Inc. in 1945. He is also vice president, Waukesha Smelting Co., and a past president of the Non-Ferrous Founders' Society.

Charles H. Ossenfort, foundry superintendent, Fairbanks, Morse & Co., Kansas City, Kans. Formerly executive assistant with Carondelet Foundry Co., St. Louis, he joined Fairbanks Morse in St. Johnsbury, Vt., in 1954. Two years later he was transferred to Kansas City as foundry superintendent.

Carl O. Schopp, assistant general superintendent, Link-Belt Co., Indianapolis. He has been with the company since 1927, and before assuming his present position in 1951 served as general foreman, assistant foundry superintendent, and foundry superintendent.

Awards—Announcement of winners of the 1961 AFS Apprentice Contest was made by Education Division Chairman Jess Toth, vice president, Harry W. Dietert Co., Detroit. (See Page 71 for the list of winners.)

Mr. Toth also was one of three recipients of AFS Service Citations presented by Collins L. Carter,

A busy spot at convention headquarters was the plant visitation desk, where Charles R. Marshall, left, and his committee provided information on where to go and when

CARL O. SCHOPP

C. J. LONNEE

DANIEL E. BEST

ROGER J. HAGEBOECK

chairman, Board of Awards, and president, Albion Malleable Iron Co., Albion, Mich. Others similarly honored were Alexander D. Barczak, operations vice president, Superior Foundry Inc., Cleveland, and Kenneth M. Smith, maintenance manager, Caterpillar Tractor Co., Peoria, Ill.

Awards of Scientific Merit were presented to Harvey E. Henderson, technical director, Lynchburg Foundry Co., Lynchburg, Va.; Theodore R. Schroeder, foundry superintendent, Pontiac Motor Car Div., General Motors Corp., Pontiac, Mich., and Herbert J. Weber, director of the AFS Safety, Hygiene and Air Pollution Control program.

Banquet Popular — The annual banquet, held Wednesday evening

"Better Design Will Sell Castings"

● A KNOWLEDGE of some simple design principles and their effective promotion would enable foundries to do more to increase the use of castings than any half-dozen, highly advertized, "revolutionary" foundry methods. This was the premise of John B. Caine, Cincinnati consultant, in his Charles Edgar Hoyt Memorial Lecture, "Cast Metals and Cast Shapes," at the AFS Congress.

Afraid of Castings — He pointed out that many engineers, designers, and users are afraid of castings because they have been taught that metal must be wrought for maximum physical properties. Despite their slightly lower mechanical properties, however, castings have the advantage of being able to assume any shape — shapes which cannot be formed efficiently by any other process. This flexibility permits a cast part to distribute the load uniformly and to minimize stress concentration. The net result is equivalent to the use of a metal that is stronger than a wrought product.

John B. Caine delivers the Charles Edgar Hoyt Memorial Lecture

Although a study of applied stress is a function of design and may seem alien to the foundryman, it is important that he become familiar with at least one phase—the design of junctions of sections and connecting members. (See "What Foundrymen Should Know About Casting Design," FOUNDRY, January, 1959.) An illustration was provided of a simple lever which can be made vastly stronger by substitution of a cast section for a wrought solid member.

Change the Radii—Stress concentration and fatigue life of L junctions can be markedly bettered by slight design changes which can be made economically only by the casting process. For example, blueprints frequently specify that radii of junctions not otherwise specified should be ¼ in. Changing the radii to the same value as the section thickness will increase fatigue life spectacularly.

Mr. Caine emphasized that the foundry industry as a whole must be familiar with this work, not only the few which already are taking advantage of it. Moreover, designers will welcome recommendations on more efficient connecting members and junctions. "What the foundry industry needs is competent men to supply useful information rather than merely a free cocktail and lunch."

Officers, award winners, and AFS officials on speakers platform at annual meeting

in the Garden Court of the Sheraton-Palace, drew one of the largest crowds in recent years. Features were the presentation of two gold medals of the society, and entertainment.

The Peter L. Simpson Gold Medal was presented to Merton C. Flemings, assistant professor, Massachusetts Institute of Technology, Cambridge, Mass., "for outstanding contributions to the castings industry in the practical application of basic research to production of quality castings, particularly in the field of light metals."

The John A. Penton Gold Medal was presented to William S. Pellini, superintendent, Metallurgy Division, U. S. Naval Research Laboratory, Washington, "for exceptional contributions to the science of metal casting through leadership in fundamental foundry research at the U. S. Naval Research Laboratory, particularly in the field of heat transfer and flow of metals."

An honorary life membership was presented to retiring president Norman J. Dunbeck.

The audience was pleased with entertainment furnished by the Barbershoppers, consisting of the Californians, a barbershop chorus under the direction of Dave Stevens, the Bay Town Four, and a girl's barbershop quartet, the Jazzabelles.

Hawaiian Session—Closing session of the Congress took place at a dinner at the Princess Kaiulani Hotel, Waikiki, Hawaii, May 15. Attending were the 92-member party of foundrymen and their families participating in a Post-Congress tour and several representatives of Honolulu's two commercial foundries.

President Norman J. Dunbeck presided. Also officially representing the AFS were Past President Collins L. Carter, Albion, Mich.; National Directors Jake Dee, Houston, Tex., and Clyde A. Sanders, Skokie, Ill.; and Past National Director William D. Dunn, Syracuse, N. Y. Unofficial host to the party was Ray Fuhrman, works manager, Honolulu Iron Works.

A tremendous industrial future for Hawaii was predicted by George Mason, director of economic development, State of Hawaii, Honolulu. Diversified manufacturing is estimated at $180 million this year, compared with only $64 million in 1950 and $146 million last year.

Industrial construction, he said, jumped from $90 million in 1955 to $207 million in 1959 and $268 million last year.

In successful operations now are two cement plants and a rolling mill producing reinforcing bars, and among projects looked into is a cast iron soil pipe plant.

Possibilities exist in metals development, particularly aluminum. There are tremendous deposits of bauxite in the islands. Low-grade titanium ore exists, as well as magnesium and germanium.

Mr. Mason pointed out that Hawaii has the lowest unemployment in the nation. It was only 2.8 per cent in 1960.

Conferring at the annual business meeting are, left to right, Albert L. Hunt, incoming national president; Norman J. Dunbeck, retiring president; and Collins L. Carter, past president and chairman of the Board of Awards

Reports on technical papers presented at the San Francisco Congress start on Page 142.

Winners of 1961 AFS Service Citations and Awards of Scientific Merit were recognized at the annual business meeting. From left to right: Herbert J. Weber, AFS; Theodore R. Schroeder, Pontiac Motor Car Div., General Motors Corp.; Harvey E. Henderson, Lynchburg Foundry Co.; Jess Toth, Harry W. Dietert Co.; Kenneth M. Smith, Caterpillar Tractor Co.; and Alexander D. Barczak, Superior Foundry Inc.

Apprentice Contest Winners Picked

● A TOTAL of 466 apprentices and trainees from 171 companies competed in the 1961 Robert E. Kennedy Memorial Apprentice Contest of the American Foundrymen's Society. Local contests conducted by 35 AFS chapters and plant groups narrowed the entries in the national judging to 120, from which 15 winners in the five classes of competition were chosen.

First-prize winners were given the option of accepting their awards at the San Francisco Congress, to which their transportation was furnished, or at the 1962 International Congress in Detroit. Two winners, both from the West Coast, made the latter choice.

The list of winners follows:

Wood Patternmaking

First Place—Kenneth E. McGarr, Poppenger & Howell Co., Akron, Ohio. *Second Place*—Donald E. Kuenzel, Central Pattern Co., St. Louis. *Third Place*—Alan E. Larson, Progress Pattern Co., Detroit.

Metal Pattern

First Place—James S. Arnold, Progress Pattern Co., Detroit. *Second Place*—Hans Joachim Thiel, Caterpillar Tractor Co., Peoria, Ill. *Third Place*—Raymond J. Laudi, Aluminum Co. of America, Cleveland.

Iron Molding

First Place—William Mulvey, Brown & Sharpe Mfg. Co., Providence, R. I. *Second Place*—Jack V. Bogaert, International Harvester Co., Indianapolis. *Third Place*—Stanley L. Purvis, Rock Island Arsenal, Rock Island, Ill.

Steel Molding

First Place—Donald A. Sprague, Columbia Steel Casting Co., Portland, Oreg. *Second Place*—Donald L. Mallder, Rock Island Arsenal, Rock Island, Ill. *Third Place*—Siegfried G. Mueller, Electrocast Steel Foundry Co., Cicero, Ill.

Nonferrous Molding

First Place—Wayne Belanger, Bird Aluminum Foundry Ltd., Vancouver, B. C. *Second Place*—Wayne Maxey, Wisconsin Aluminum Foundry Co., Manitowoc, Wis. *Third Place*—Edwin D. Lasecki, Zandt Brass Foundry Inc., Seattle, Wash.

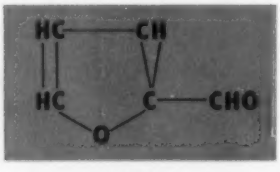
Education Division Chairman Jess Toth (right), Harry W. Dietert Co., with first-prize-winning apprentices William Mulvey, Brown & Sharpe Mfg. Co., Providence, R. I.; Kenneth E. McGarr, Poppenger & Howell Co., Akron, Ohio, and James S. Arnold, Progress Pattern Co., Detroit

The Furan Family of Binders

By ROBERT J. MULLIGAN
Marketing Manager
Federal Foundry Supply Div.
Archer-Daniels-Midland Co.

● FURAN is a generic term denoting the basic structure of a family of chemical compounds. Furan also is the name given to the parent compound of the series. The structure of furan is shown in an accompanying diagram. Furfural and furfuryl alcohol are the two furan compounds of most commercial importance. The structures of these materials also are shown in accompanying diagrams.

Furfural can be prepared by chemical methods from a large number of cellulosic products. Commercial production in this country is based primarily on the processing of corn cobs and oat hulls. Hydrogen is allowed to react with furfural to produce furfuryl alcohol. Both furfural and furfuryl alcohol resins can be modified with any number of other components to produce end



FURFURAL

products of widely differing properties.

Furfuryl alcohol and furfural can be polymerized or resinified by heat, by acidic catalysts, or by a combination of acid and heat. While the monomeric materials probably could be used as binders, prepolymers or partially resinified systems superior to the base materials have been developed. Stable resins possessing optimum core binding properties have been produced by careful control of formulation and processing. The curing process is exothermic and thus, self sustaining. Heat generated during curing speeds up the rate of cure.

As would be expected, different binders and catalysts are used for hot box, air curing, dielectric baking, and conventional baking applications.

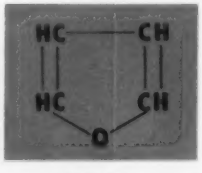
Hot Box Process—In this process, curing is accomplished by a combination of catalyst and heat. Heat alone is sufficient, but the catalyst accelerates curing. When the sand-resin-catalyst mixture is blown into a corebox heated to 375-475° F, the heat from the box activates the catalyst. The resin adjacent to the hot box cavity walls is cured immediately, forming a shell. Within seconds the shell is thick enough to support the core, which then can be removed from the box.

Because of the exothermic nature of the reaction, curing will continue toward the interior of the core for several minutes until complete curing occurs. If the core cross section exceeds about 2 in., a short bake at 300-400° F may be desirable to complete the internal cure of the core.

The catalyst is not consumed completely during the curing process. It plays a second role after the mold is poured by assisting breakdown of the bond, enhancing core collapsibility.

Air Curing—This process is used for large cores where high production rates are not required. Cores can be prepared and completely cured without baking. An active catalyst used in the mix starts curing the binder as soon as the two components are brought into intimate contact. By careful control of the catalyst level, working life of the sand mix can be regulated from about ten minutes to more than an hour.

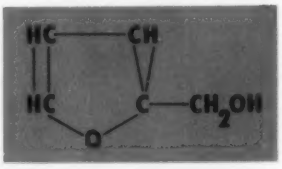
Air curing should be differentiated from air setting. In the former, complete curing takes place without external heat. Since the curing reaction is exothermic a temperature rise often is observed. The greater the sand mass, the higher the temperature rise. Thus, deep curing is very good with this process. Oxygen does not enter into the curing reaction.



FURAN

Oven Curing—Furan-sand mixes are being cured in dielectric and conventional ovens. The mixes contain cereal and water so that sufficient green strength is developed. Curing times in dielectric ovens have been cut by 35 to 50 per cent. Dielectric oven curing capacity often can be doubled.

Furan binders can be used in two ways for conventional baking applications. The first is as a replacement for about 25 per cent of the core oil used with an equal amount of the furan binder and some catalyst. Baking time is decreased by 50 per cent with comparable tensile strength and casting properties.



FURFURYL ALCOHOL

The other method is to use a furan binder and catalyst along with cereal and water as a very fast baking system. With this mix the same oven cycle can be used for large and small cores without danger of over or under cure simply by using more catalyst in the sand mix for the large cores.

Continuing Research—Present research work is directed to improving binders currently in use, as well as to development of new curing techniques for new resins. The field is a fertile one because the potential of the furans has been investigated only slightly. Possible new uses include gas curing without any heat or baking required, curing with heated air, and other novel methods of triggering the curing reactions.

How to Work

FURAN BINDERS

Into Production

Demand for increased production prompted this foundry to try furan core binders. For general use, it developed a furan-oil blend

By JOSEPH P. CUMMINGS
Superintendent of Cores
Truck Engine Plant
International Harvester Co.
Indianapolis, Ind.

These complex cores were produced with furan binder and made in cast iron coreboxes

● A NEED for increased core production faced the Truck Engine Plant foundry of International Harvester Co., Indianapolis, in the spring of 1960. The need was brought about by the development of new engine models and increasing production of some current products.

About the same time, foundry suppliers were anouncing the availability of furan resin sand binders, and we investigated their use. Tests were run by mixing small batches of furan-bonded sand and blowing sample cores. Cast iron boxes and the coreblower used for phenolic resin-bonded shell cores were used.

Sample castings indicated that no adverse conditions were present. The findings were that better hot strength existed, less gas was developed, and shakeout was improved.

Further Investigation—Since the necessary equipment for a start was on hand, additional tests were conducted to determine what could be expected from furan resin-bonded sand and how much it would cost compared to the materials then being used. Coreboxes were run at the recommended 450 to 475° F. Temperature was checked by mounting thermocouples in critical sections of the top and bottom halves of the boxes.

The placement and height of burners were changed until a suitable heat pattern was developed. Allowances and further adjustments were necessary to compensate for heat loss due to frequent investment of cold, damp sand.

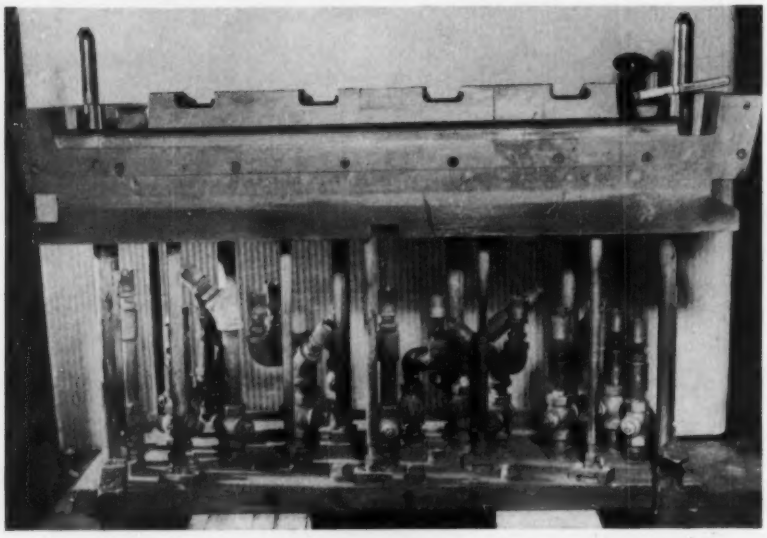
The next step was to determine possible production rates. By changing speeds of existing coreblowers and adjusting temperatures accordingly, much faster production was obtained. In one case a core formerly requiring nearly three minutes to produce by the shell process was produced in less than one minute. Machine time for making the shell process core from blow to strip had been 1 minute, 51 seconds; time for the furan-bonded sand core from blow to strip was 14 seconds.

Additional time was consumed by filling the sand magazine, removing the core, and blowing out the box. More modern machines and improved handling methods will reduce the time spent outside of the machine cycle by 50 per cent or more.

Material costs also were an influencing factor. Since many of the shell process cores discussed above were solid phenolic resin-bonded sand cores, no change in volume of sand per core was found. Because of the difference in cost of phenolic resin-bonded sand and furan-bonded sand, considerable saving was obtained in this area.

The simplicity of mulling the sand was important, too. Difficulty in producing phenolic resin-coated sand in sufficient volume often presented production problems. Since changing to furan-bonded sand this problem has not existed, and we have mulling capacity to spare.

Casting Surface Problem—Tests have shown that we can expect a slight fusion or roughness about



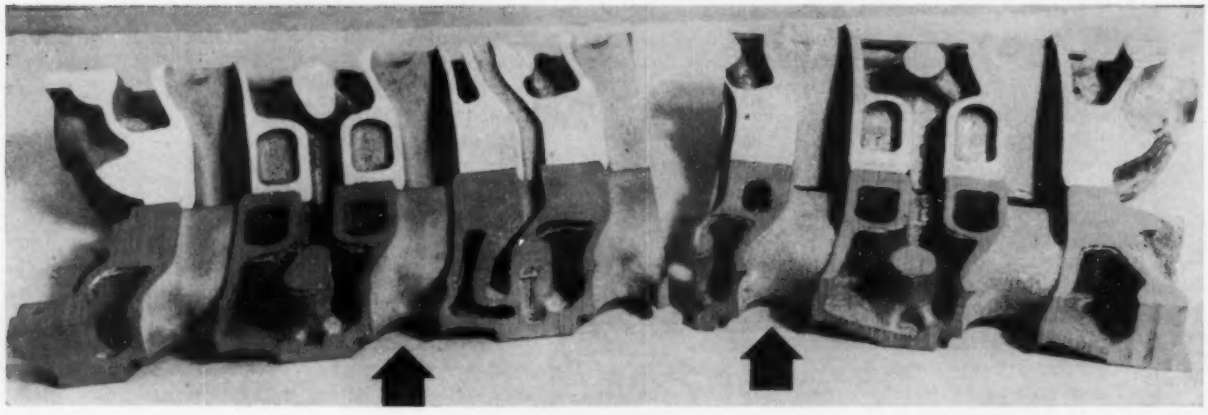
View shows burners for heating coreboxes. They are adjustable for best heat distribution

0.005-in. deep on the casting surface from an undipped furan-bonded core. Since passages carrying fuel and oil must be free from roughness and any foreign materials, dipping of certain cores is necessary.

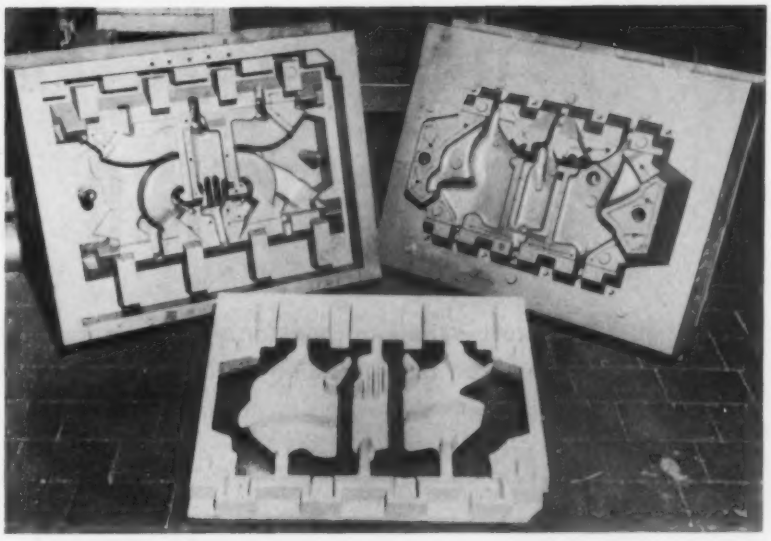
The time involved from the moment a core is stripped from the box until it is dipped is important. Cores having heavy sections of two or more inches will crack if not given sufficient cure time prior to dipping. The necessary time can be obtained by placing heavy-sectioned cores to be dipped on a belt conveyor that passes through an oven giving the cores 12 minutes additional cure time. Temperatures of 300 to 325° F are maintained in the oven. Cores are dipped hot at the end of the belt and passed through a vertical drying oven at 425° F for 15 minutes.

Test results led to the use of furan binders for making port cores, pipe

A belt conveyor carries heavy-sectioned furan resin-bonded cores through a curing oven



Arrow indicates smooth passage resulting from using a dipped core (left). Rougher surfaces resulted when an undipped core was used as at right arrow



Core in foreground is part of an assembly for a manifold. It is of furan-bonded sand blown in the cast iron box shown

cores, and manifold water jacket cores. Plans are underway to expand the use of these binders. Barrel cores, cylinder head jacket cores, and cylinder block jacket cores are next on the agenda.

Furan-Oil Bonded Cores—Due to increased demand for castings, a capacity—and hence a quality problem—developed in the oil sand coremaking section. Excessive oven loads and shortened baking cycles brought realization that we were extending beyond our ability to bake cores correctly. In one case an oil-bonded crankcase barrel and body core was not baking thoroughly. The results were core scrap from handling and casting scrap due to scabs.

By reducing the oil one-third or more and substituting 3-lb of furan resin and ½-lb of catalyst and adjusting cereal and clay to give satisfactory green strength, this problem was solved. The old and new mixes and the mixing sequence are given in Table I. In spite of the higher cost of furan resin, new mix cost was lower than that of an oil sand mix it replaced.

TABLE I—Old and New Sand Mixes*

Constituent	Old Mix (pounds)	New Mix (pounds)
Lake sand	550	550.00
Silica sand	350	350.00
Bank sand	100	100.00
Cereal	13	11.00
Bentonite	9	5.00
Core oil	10	5.00
Furan resin		3.00
Catalyst		0.50
Kerosene and parting**		0.5-0.75
Water	18-21 pt	18-21 pt

*Start with sand and cereal and mull 40 sec; add catalyst and water, mull 1 min; add binders, mull 2 min; add kerosene and parting, mull 5 sec and discharge. A high speed muller is used. Care must be taken to avoid developing excessive heat in the mix.
**This is a mixture of 5 gal kerosene to 0.5 lb dry parting compound.

Drier expansion causing cracked cores has been eliminated on a very critical manifold core. The rapid curing action of furan resin takes place prior to the damaging drier expansion. After the core is set and sand grains are knitted by resin, the core will have a tendency to lift out of the drier as expansion takes place. The oil still in the mix helps protect the resin against oven temperatures.

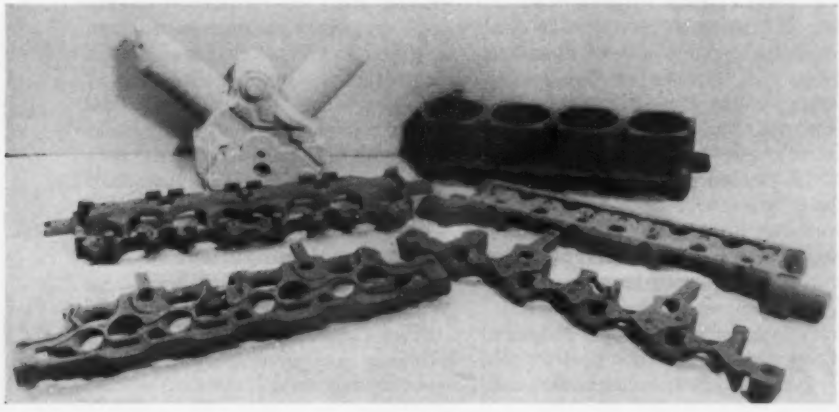
We now have a five-station, automatic coreblower producing barrel cores, manifolds, and slab cores of the furan-oil sand blend. These cores are baked in a continuous oven with oil-sand cores, and no change has been made in oven cycles. Thus, while core capacity has not increased, scrap resulting from insufficient baking has been minimized for those cores converted to oil-resin sand. If all oil-resin cores were to be cured, oven cycles could be speeded up at least 20 per cent and in some cases up to 50 per cent.

Advantages—The adaptation of furan resin in oil-sand has reduced costs in several ways:

1. Handling breakage is reduced. This is attributed to more completely cured cores.
2. Scrap due to blows is reduced because of lower gas content of a sand mix, having strength equal to former mix.
3. Less breakage occurs in driers because of fast attainment of core strength, occurring even before drier expansion takes place.
4. Shakeout efficiency has been improved because of high collapsibility properties of furan resin.
5. Casting defects, attributable to scabs resulting from incompletely cured cores, have been reduced.

The use of furan-oil blend was begun in mid-February 1961, and, because results have been so favorable, further application of this practice will be made as fast as possible.

A program now is under way for conversion to furan resin-bonded sand of the phenolic resin shell barrel core and oil-bonded cores shown here



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Using H-13 Steel in

DIECASTING DIES

H-13 steel is the most popular type in use for aluminum, magnesium, and long-run zinc diecasting dies. This article reviews important points in relation to its properties and application

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● AISI H-13 hot work tool steel is by far the most popular steel used for aluminum, magnesium, and long-run zinc diecasting dies. It has not proved successful in copper-base alloy diecasting because of the high temperatures involved.

Although H-13 steel can be used in parts such as slides, ejector pins, guide pins, etc., this article will be concerned primarily with those properties and characteristics of H-13 required by the die or die insert itself since this use is the heart of the diecasting process.

As defined by the American Iron and Steel Institute, H-13 steel is a hot work tool steel of the following chemical analysis, by percentages: C, 0.35; Mn, 0.40; P, 0.025 max; S, 0.025 max; Si, 1.10; Cr, 5.00; V, 1.00; Mo, 1.50. The amounts of manganese, phosphorus, sulfur, and silicon are not specified by AISI.

The analysis itself does not determine whether a material will make a good diecasting tool, but the combination of analysis, melting and pouring practices, hot working practices employed to reduce the ingot to a bar or forging, and heat treatment determines the properties and characteristics of the steel.

To make a satisfactory diecasting tool, H-13 steel must be melted by one of the following processes: 1. Electric arc or induction air melt. 2. Air melt plus vacuum degassing. 3. Vacuum arc remelt (consumable electrode). 4. Vacuum induction melt.

Electric arc or induction air melted material provides the mechanical properties necessary for a satisfactory diecasting tool. Although vacuum melting usually results in an increase in mechanical properties over air melted material, the use of vacuum melted material solely for this purpose would not be practical.

Vacuum melting produces a cleaner steel, thus giving the diemaker more assurance that the steel is free from internal defects, but this observation is not meant to imply that air melted material will have internal defects. In fact, most diecasting dies are made successfully from air melted material.

Harmful internal defects such as pits and excessive nonmetallic segregations usually are confined to the center portion of the bar or forging. When an ingot solidifies, entrapped gases and segregations are in the center of the ingot, which is the last part to solidify. Because the center is worked less than other portions during forging or rolling, small voids are not always welded shut during hot-working operations.

To eliminate shipping material with internal voids to the customer, the producers of H-13 steel subject it to strict inspection standards. A disc cut from the end of the bar or forging is etched in hot hydrochloric acid, which differentially attacks voids, inclusions, and areas lean or rich in alloy.

The observations made are meaningful to a trained metallurgist, but they must be confined to the specific portion from which the disc was cut. Because processing techniques are uniform, the metallurgist must assume that the rest of the bar or forging is of similar quality. The strict demands for high internal quality of a diecasting die steel, however, necessitate supplementing the hot acid etch test with ultrasonic inspection.

The principle of ultrasonic inspection is illustrated in Fig. 1. Electrical energy is converted into mechanical energy by a quartz crystal (A). The mechanical energy, in the form of vibrations of very high frequency, is transmitted into the steel. When the transmitted wave reaches the opposite side of the steel (C), it is reflected back to the point of transmission. Should the path of the wave encounter something different from the metal being inspected, such as a void or inclusion (B), the time necessary to produce back reflection is shortened, and the defect shows up as a blip on the oscilloscope screen.

Unfortunately, not only pits, inclusions, and other undesirable discontinuities cause an interruption

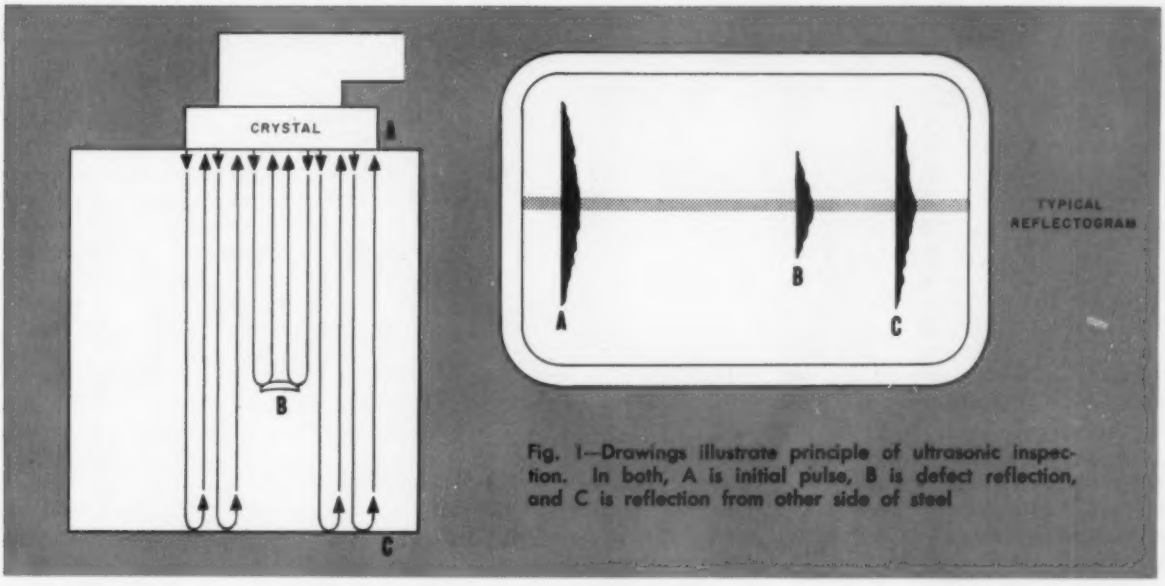

Fig. 1—Drawings illustrate principle of ultrasonic inspection. In both, A is initial pulse, B is defect reflection, and C is reflection from other side of steel

in the sonic wave. Alloy segregations, irregularities in size and orientation of grains, and other factors not detrimental to steel quality also do so. As a result, even a highly skilled operator sometimes misinterprets the sonic results. Consequently, there are a few occasions when the diemaker encounters defects in the cavity even though the best tool steel practices and inspection procedures have been employed.

Although some grades of steel are inherently cleaner than H-13, none of them possesses the other properties and characteristics necessary to make a good diecasting tool. To discuss these other properties and characteristics, we must consider the requisites for a diecasting tool. These are shown in Table I.

Internal Defects—The first item listed, freedom from internal defects, we already have discussed.

Machinability and Polishability—A machinability index such as that used by machine shops is of little practical value to the diecasting diemaker since the most critical and often most expensive operations are final finishing and polishing. H-13 steel is supplied to the diemaker in the annealed condition and, as such, can be machined readily with high speed steel or carbide tools without excessive tear, drag, or tool chatter.

In recent years, several steel producers have added sulfur to H-13 steels to facilitate machining. The sulfurized H-13 steels, to be referred to hereafter as H-13 S, normally are supplied heat treated to one of two hardness levels—that is, about Rockwell C 25 or about Rockwell C 44.

The Rockwell C 25, H-13 S material is handled like the conventional H-13 steel in that it must be heat treated after machining. The advantage over annealed H-13 is in the ease of machining. The Rockwell C 44, H-13 S is machined in the hardened condition, and no further treatment is necessary. Conventional H-13 steel is extremely difficult to machine at hardness levels above Rc 35 unless very rigid machines and special tools are used. The advantage of using Rockwell C 44, H-13 S steel is that the problem of size change in heat treatment is eliminated. One disadvantage is that machining costs generally are higher.

TABLE I—Requisites of a Diecasting Die Steel

1. Freedom from internal defects
2. Machinability and polishability
3. Strength and toughness
4. Stability in heat treatment
5. Weldability
6. Resistance to erosion and heat checking

Principal drawbacks to using the sulfurized material at either hardness level include the following: 1. It will not take as fine a polish. 2. It is more difficult to weld. 3. It is considerably less tough than conventional H-13 steel.

Because of the high alloy content, which is necessary to produce the air hardening and hot work characteristics, H-13 is somewhat sluggish in its response to hardening. If H-13 is quenched from too high a temperature or held at temperature too long, a condition which metallurgists call retained austenite occurs. To the polisher, austenite is a soft constituent, existing at random throughout the steel, which has a tendency to drag, tear, or pull out during polishing. This characteristic promotes a random pattern of hills and valleys frequently described as "orange peel." A double or triple temper or a deep-freeze treatment is necessary to minimize the amount of retained austenite.

Strength and Toughness—Provided that the die has been designed correctly, H-13 steel possesses sufficient strength and toughness to resist the combined stresses set up by injection and clamping pressures and thermal stresses. Room temperature and elevated temperature tensile properties for notched and unnotched specimens which have been heat treated to various hardness levels are shown in Fig. 2. H-13 S steel has similar properties.

The difference in impact properties between H-13 and H-13 S steels

TABLE II—Charpy V-Notch Impact Strength

Test Temperature (° Fahrenheit)	H-13 Hardness (Rockwell C)	H-13 Impact (ft-lb)	H-13 S Hardness (Rockwell C)	H-13 S Impact (ft-lb)
−100	54	4.7	53	4.8
RT	53	10.0	53	6.8
500	54	20.0	53.5	14.5
1000	54	22.5	53	11.8
−100	52	4.7	51.5	4.3
RT	52	9.7	51.5	6.0
500	52	22.0	51.5	13.7
1000	52	24.6	51.5	12.8
1050	52	24.5	51.5	12.2
−100	47	6.0	49.5	3.2
RT	46	18.0	49.5	7.3
500	47	29.6	49	15.3
1000	47	33.3	49	14.0
1100	47	31.5	49	13.0
−100	44	7.0	...	...
RT	43	18.0	...	...
500	43	38.0	...	...
1000	43	43.5	...	...
1100	44	41.5	...	...

is shown in Table II. Note that H-13 S steel shows a slight decrease in impact strength with increasing test temperatures above 500° F and is decidedly less tough than H-13 steel at all equivalent hardness levels.

Stability in Heat Treatment—To discuss dimensional changes that occur in heat treating H-13 steel, we first must differentiate between size change that results from the normal linear movement of steel and changes caused by distortion. Linear movement during heat treatment is a normal behavior characteristic of all steels. The extent and direction of this movement depend on so many variables that it is impossible to predict them with accuracy. Composition, mass, geometry, prior processing history, and heat treating techniques are contributing factors. It is common practice to allow for about 0.0005 in./in. growth in length and about 0.0002 in./in. growth in width, but these figures are merely rules of thumb. Size changes could be considerably more or less.

Mechanical factors that cause dimensional change in heat treatment can be controlled to a large extent. Heavy hogging and cutting operations, however, cause high residual stresses in the steel. At room temperature, the steel is strong enough to resist these stresses. Where the temperature is increased to the 1000 to 1200° F range, the residual stresses may exceed the yield point of the steel and cause the steel to deform and acquire a new, distorted shape. This deformation relieves the residual stresses. Dies being heat treated always must pass through this temperature range.

If the distortion occurs during the heating cycle for hardening, the distorted shape becomes fixed after hardening. It therefore is recommended that dies requiring considerable metal removal be rough machined to within ¼ to ⅛ in. of finished size. The die then should be stress relieved at 1000 to 1200° F until the entire piece has been heated throughout, then should be air cooled. In the stress relieving operation, the die will acquire its new, distorted shape, which can be compensated for by machining while the steel still is in the annealed condition and sufficient metal is available to allow for this correction.

Large dies, if not supported properly, may distort during the heat treating cycle just from the force of their own weight. Proper support of the die during heating and quenching operations is extremely important to minimize distortion.

Weldability—In many instances, welding is the only practical method of accomplishing design changes, repairing broken dies, or filling in an occasional internal defect. Since H-13 is a deep hardening steel, it is susceptible to cracking in the heat-affected zone adjacent to the weld unless handled very carefully.

The two principal welding processes used are coated electrode metallic arc welding and tungsten inert gas welding. If the metallic arc is used, coated welding rods are suitable for welding H-13 steel. For tungsten inert gas welding, a bare rod is required. This rod should correspond to the H-13 chemistry or at least be one which heat treats the same, such as H-11 and H-12 hot work tool steels. The atomic hydrogen and oxyacetylene processes are used to a lesser extent. These also require a bare rod, but the carbon content in the rod should be increased by about 35 per cent since there is a heavy loss of carbon during welding.

In practice, most dies are welded in the hardened condition. The hardened die should be preheated to a temperature close to but not exceeding the temperature employed in heat treatment—normally around 1100° F. This temperature should be maintained as closely as possible during welding, and the die should not be permitted to drop below 700° F. If it drops below 700° F, the die should be recharged in the furnace and brought back to the tempering temperature before additional welding.

After welding, the die should be postheated at the temperature and held at heat for one hour per inch of base metal thickness, then slow cooled at 50 degrees per hour or less. Post heating after welding helps to refine the grain structure and effects uniform hardness of the weld deposit. The hardness of the coated rod as deposited is between Rockwell C 51 and 55. Hardness of a bare rod deposit is slightly lower.

For optimum results, the dies should be annealed prior to welding. Essentially the same preheat and postheat treatments as discussed above are used. With annealed dies, however, the postheating can be done at about 1250° F. If any appreciable machining or grinding is done to remove excess weld metal, the die should be stress relieved before final heat treatment.

Resistance to Erosion and Heat Checking—Resistance to erosion and heat checking cannot be put down in figures. There still is a lot to learn about the mechanics and causes of these problems. Erosion, or more correctly erosion-corrosion, is the wearing away or washing of the die surface by the action of molten metal. Heat checks are small surface cracks thought to be caused by a combination of corrosion and thermal fatigue due to the alternating stresses set up by the heating and cooling of the die surface during operation. Several factors influence ability of the die to resist erosion and heat checking.

1. Within the hardness ranges normally used for diecasting dies, the harder the die, the more resistance to erosion and the less resistance to heat checking.

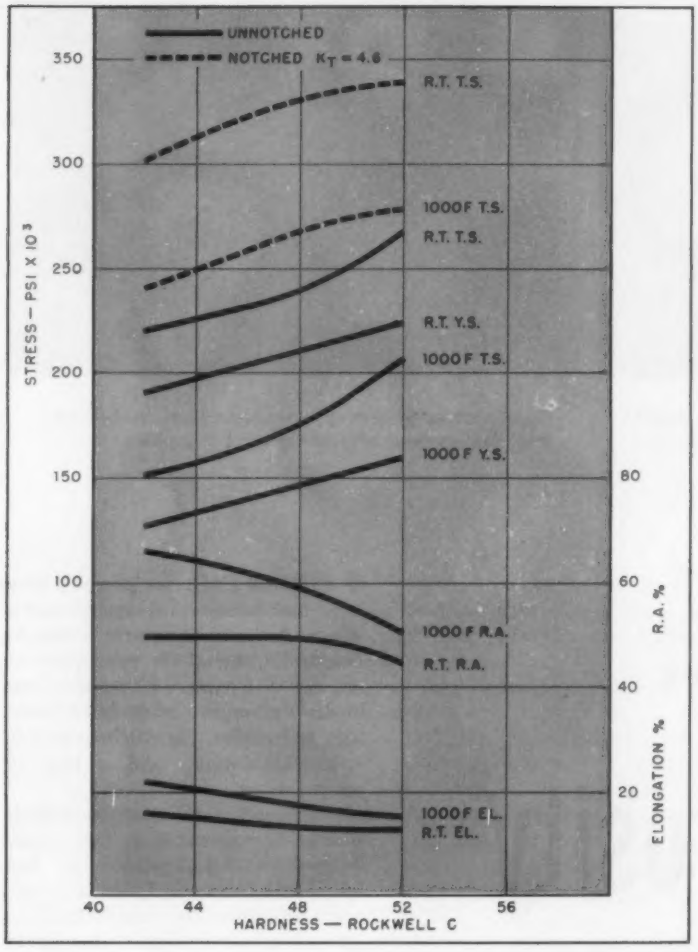

Fig. 2—Chart shows room temperature and 1000°F tensile properties for notched and unnotched specimens of AISI hot work tool steel heat treated to various hardness levels

2. High temperatures of molten metal promote both erosion and heat checking.

3. High velocity and turbulence of the molten metal within the die promote erosion.

4. Generally, the finer the polish on the die, the less resistance the die has to erosion.

5. Carburization of the die surface during heat treatment promotes heat checking but adds erosion resistance.

6. Decarburization of the die surface during heat treatment promotes both erosion and heat checking.

7. The effect of nitriding the die surface on resistance to erosion is debatable. There are two schools of thought within the diecasting industry. Some persons believe that the very hard surface formed in nitriding definitely resists erosion better than a surface that has not been nitrided. Others believe that the nitrided case has a tendency to spall or flake off, particularly in areas of direct impingement of molten metal, thus resulting in shorter die life than that obtained with an unnitrided die. Spalling of the nitrided case can happen quickly if the nitriding is done over a decarburized surface. It is far better to have a slightly carburized surface, which is not harmful, than to have any degree of decarburization.

Heat Treatment—To produce the properties required of a diecasting die, the die must be properly heat treated. To produce the best results, the following procedures are recommended:

Stress-Relieving — For minimum size change, a stress relief anneal after rough machining and prior to heat treating is recommended. This operation can be accomplished by heating the die to 1200 to 1300° F for two to four hours, depending on size, then air cooling.

Hardening—1. Preheat to 1450 to 1500° F. 2. Transfer to high heat of 1850° F and hold until heated through. 3. Cool in air to below 150° F. 4. Double temper immediately to the desired hardness (see Table III).

Controlled atmosphere furnaces or salt baths should be used for preheat and high heat. The cooling rate during the hardening cycle

TABLE III—Tempering H-13 Steel

(Tempering Series—Hardness results for 4-in. cubes heated to 1850° F and double tempered at indicated temperatures for 4 + 4 hours)

Tempering Temperatures	Rockwell C	Brinell
1000° F	50/52	481/512
1050° F	49/41	469/496
1100° F	46/48	432/455
1125° F	40/42	371/390
1150° F	35/37	327/344

of large dies should be accelerated with a fan or air blast to cool the die below about 1320° F as fast as possible to minimize the amount of soft transformation products.

Nitriding—Where high wear resistance is needed, as in movable cores and slides, the part may be nitrided after all polishing has been accomplished. Dies and die inserts should be gas nitrided for 10 to 12 hours at 950° F to produce a case of approximately 0.004 to 0.005 in. Cores, ejector pins, plunger sleeves, and slides can be treated for 40 to 50 hours at 950° F to produce a case of about 0.012 to 0.015 in.

Oxidizing—It usually is beneficial to put a die in service with an oxide coating. Oxidized surfaces act as a lubricant in themselves and retard the start of the heat checks; their main function, however, is to act as a carrier for the lubricant. An oxide coating can be formed in tempering or, if the coating is removed by subsequent grinding or polishing operations, by heating the die two or more hours at 1000 to 1100° F depending on prior tempering temperatures.

This paper was presented at the National Die Casting Exposition and Congress of the Society of Die Casting Engineers in Detroit, Nov. 8-11, 1960.

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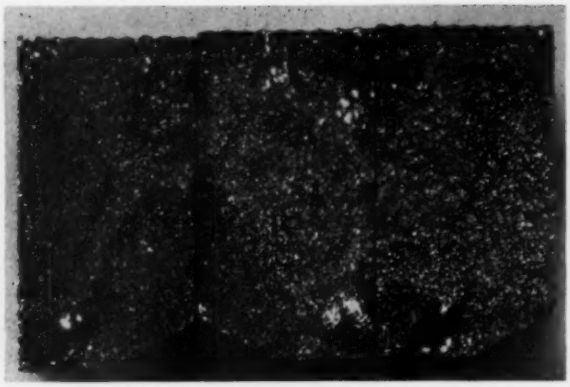

Fig. 1—Appearance of pinholes in cast iron piston rings. Note the presence of shotlike particles

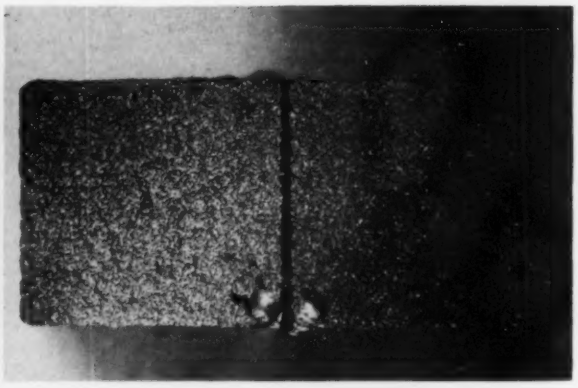

Fig. 2—Fractured casting shows embedded deoxidized steel shot without any evidence of a pinhole

What Causes

Pinhole Porosity

in Gray Iron?

A likely cause of pinhole porosity in gray iron is discussed by the author. Results of experiments on this problem are covered

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● PINHOLING has plagued gray iron foundrymen for many years. When it occurs it creates a frantic search for the cause and, most of all, for the cure. Generally, immediate changes are made in pouring techniques, iron composition, sand composition, and a host of other factors.

Eventually, the foundryman finds that pinholing suddenly has ceased to exist and he believes he has found the answer. Upon a recurrence of pinholing, however, those alterations which he believed to have worked for him during the last siege, will not solve his present problem.

This paper discusses pinholing only and not defects such as shrinkage or others caused by poor practices. A mechanism by which pinholing forms and paths that might be investigated to eliminate this problem are discussed. No cure is suggested.

Observations — Sporadic occurrences of pinholing have been observed frequently in piston ring castings. Upon stressing the ring, for either testing or installation, complete fracture occurs through the pinhole. The apearance of the pinhole is typical and has been described very effectively by others.[1]

In addition to the appearance described by these investigators, a shot-like particle often appears either imbedded in or loosely attached to the inner wall of the pinhole as shown in Fig. 1. Microscopic examination of any of these particles reveals that they are of

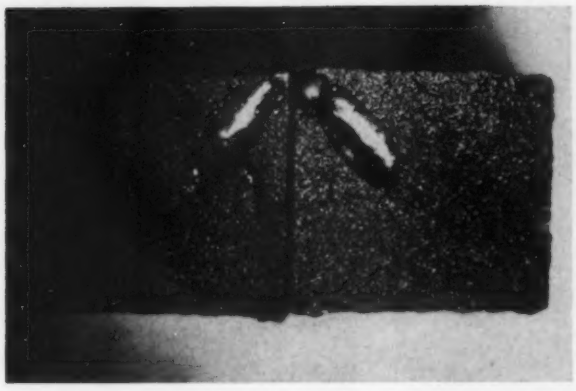


Fig. 3—Oxidized steel shot was added to the mold for this casting. A large pinhole was the result

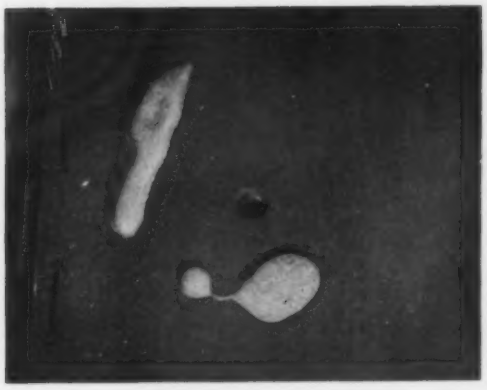


Fig. 4—This iron, poured on an open mold surface, was not treated with aluminum. It did not react

gray iron but had been cooled at a much faster rate than the surrounding material.

Preliminary Experiment—An experiment was contrived to determine if the shot-like particles were in some way responsible for pinhole formations. Two small quantities of No. 230 steel shot were treated so that one quantity was clean and completely deoxidized and the other quantity thoroughly oxidized.

Deoxidation was performed in dissociated ammonia at 1800° F. The shot emerged from the furnace with a bright surface. Oxidation was accomplished by heating the shot, in air, at 1200° F. for one hour. The shot was thoroughly oxidized.

Green sand molds were produced, and, as they were being closed, shot was scattered across the drag surface. Stack molds, eight flasks high, with the mold cavity in the cope and the drag surface flat were used. Four cavities were produced in one mold assembly, producing 32 castings per stack. The castings were piston rings, 3½ in. in diam, ¼ in. thick with ¼ in. of radial wall. Oxidized shot was added to one stack and deoxidized shot added to another.

After pouring, shaking out, and cleaning, the ring castings were broken to observe the results of the shot additions. Fig. 2 shows the results of adding deoxidized shot to the mold cavities. The shot is clearly evident, but a pinhole did not form.

Fig. 3 shows the results of adding oxidized shot to the mold cavities. A large pinhole was formed near the shot.

Explanation of Pinhole — Based upon this experiment an explanation for pinhole development was made as follows:

1. Through some mechanism a shot-like particle is divorced from the main stream of iron. This mechanism will be discussed later.
2. The shot is oxidized by steam in the mold cavity.
3. The shot is then engulfed by the still molten iron.
4. Carbon in the molten iron reduces the previously formed oxide film which forms a gas, thus:

$$Fe_2O_3 + 3C \rightarrow 2Fe + 3CO\uparrow \text{ or}$$
$$2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2\uparrow$$

5. A pinhole forms.

This explanation seems to be borne out by the absence of a pinhole when the clean, deoxidized shot was added to the mold. Simply, there was no oxide film with which the carbon could react.

Effect of Aluminum—One of the most notorious creators of pinholes is aluminum added to molten iron, either accidentally or intentionally. If the explanation given above becomes valid, it is believed that the formation of pinholes in aluminum-treated iron should be created in the same manner.

To study pinholes in aluminum-treated iron two 300-lb ladles of iron were tapped from the cupola and an 0.40 per cent aluminum addition made to one ladle while the other ladle was left untreated. The two types of iron were poured into stack molds, and small quantities were poured on open mold faces.

The result of pouring the irons on open mold faces was very enlightening. The untreated iron remained in a quiet pool with little or no activity being observed during solidification, Fig. 4.

The aluminum-treated iron reacted violently with the mold. As the iron was being poured on the mold surface rather efficient wetting was detected, and the pool spread over a large area. Very shortly thereafter, the pool contracted rapidly to a much smaller area. The discolored area on the mold in Fig. 5 shows the extent to which the pool spread. The area to which the pool contracted is indicated by the contour of the solidified iron.

Forms Shot-like Particles—What was of even more interest was the shot-like particles that the aluminum-treated iron left adhering to the mold surface as it contracted to its final shape. Fig. 6 shows the particles to be of both spheroidal and filament shapes.

The rings cast with the two types of iron were fractured revealing very few small, insignificant pinholes in those cast with untreated iron and the typical profusion of subsurface pinholes for those cast with aluminum-treated iron. Upon very close and careful examination it was found that shot-like particles were present in the pinholes produced in the aluminum-treated ring

Fig. 5—Aluminum-treated iron. Note the darkened area on the mold and compare with Fig. 4. Also, note that shotlike particles have formed

castings, as shown in Fig. 7.

The iron configurations cast on open mold surfaces were fractured. Those cast with untreated iron revealed no pinholing. Those cast with aluminum-treated iron revealed pinholes and shot-like inclusions as shown in Fig. 8.

It was interesting to note that pinholing in the aluminum-treated iron, poured on an open mold surface, occurred only at the surface exposed to the mold. Pinholing could not be detected under the surface which solidified in air. Pinholing, however, occurred at all surfaces in the ring castings.

Graphite Film Formation—This phenomenon is observed in a great many pinholes and has been described by Dawson and Smith.[1] They also explain that graphite is frequently observed on iron surfaces that have been heated in various atmospheres.

Graphite films may or may not be detected in pinholes in finished piston rings. These films always are present in pinholes produced in aluminum-treated iron and usually are quite thick. In several instances during this study, however, some pinholes did not contain a graphite film.

Possibly the atmosphere within the pinhole must be of a certain composition to promote formation of the film. In all probability the atmosphere would be composed of CO or CO_2, and some ratio of concentration of these gases must be attained before graphitization can occur. This may be related to carburizing atmospheres and control of carbon potentials so thoroughly investigated for steels.[2]

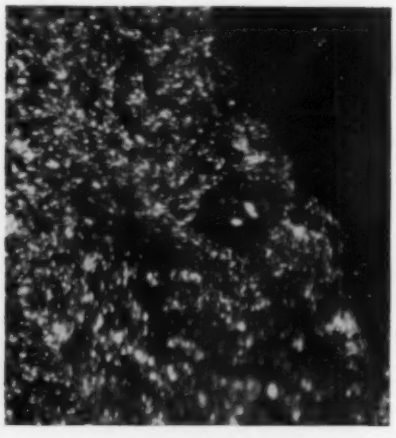
Aluminum additions to irons increase markedly the tendency to graphitize. This is believed to have caused the violent contraction of aluminum-treated iron when poured on an open mold surface. It appeared that aluminum acted as a wetting agent for the iron in the very early stages of iron-mold contact.

Later, however, kish graphite was rejected at the iron-mold interface, Fig. 9, and the iron was repelled by the sudden change in mold composition, i.e., the mold was no longer of the sand molded originally, but suddenly consisted of graphite film which repelled the iron. Kishing was not observed in the untreated iron, Fig. 10.

This graphitizing tendency also might account for the increase in

Fig. 6—View is of shotlike particles left on the open mold surface when the aluminum-treated iron contracted

Fig. 7—Shotlike particles found in aluminum-treated iron casting



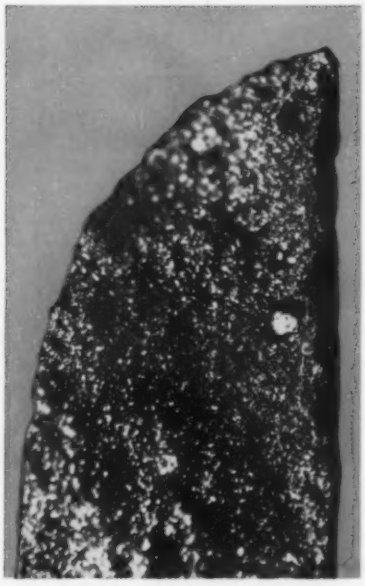


Fig. 8—A fracture of treated iron poured on open mold. Shot was formed on bottom surface, yet none developed next to air

graphite film thickness in pinholes found in aluminum-treated irons.

Discussion—Experiments and observations described in this article lead to the following conclusions:

1. One type of pinholing is caused by a gas produced in the reduction of a film of oxide on shot-like particles.

2. The gases produced are carbon monoxide or carbon dioxide or a concentration of both.

3. The shot-like particles are produced by a divorcing of small quantities of iron from the parent stream.

4. The divorcing of small quantities of iron from the stream can be caused by iron-mold incompatability.

5. Aluminum is one element that, when added to iron, creates a very undesirable iron-mold relationship.

6. Aluminum-containing irons do not tend to pinhole when solidified in air, but do when in contact with a green sand mold surface.

7. The abrupt change in mold surface brought about by kishing of graphite in aluminum-containing irons results in a violent repulsion of iron leaving behind shot-like particles adhering to the mold walls.

8. Graphite films often found in pinholes are possibly formed by a gas-metal reaction.

Although some investigations have revealed shot-like particles in pinholes, their presence has been ignored or passed over lightly.[3] However, it is more likely that the techniques used to examine pinholes, such as rough machining, remove the shot. If a fracture technique is employed the shot simply may fall out of the pinhole. Since in most cases a carbonaceous lining exists in the pinhole, it is conceivable that the shot are literally rattling about in their confinements.

A paper presented by Dawson,[4] contains a macrograph in which at least four shot-like particles are distinctly visible in a fracture surface, and yet their presence had not been discussed.

Results of the experiments indicate that varying degrees of iron-mold compatabilities exist. Much of the work done previously by other investigators has shown that a change in sand composition can reduce the tendency toward pinholing. Dawson and Smith[1] indicate that additions of pitch, for instance, to molding sands limits the occurrence of pinholing, but hydrogen pick-up from moisture, the evolution of which is supposed to form pinholes, is not affected. This is clearly a matter of iron-mold relationship.

It has been proved that aluminum additions to iron increase the tendency for hydrogen pick-up.[1, 5, 6] It is suggested that hydrogen and other gases can and do influence or create pinhole formations. But, in addition, the manner in which these gases affect iron-mold compatability should not be overlooked.

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Fig. 9—Appearance of surface of treated iron when poured on an open mold. Note the kish graphite

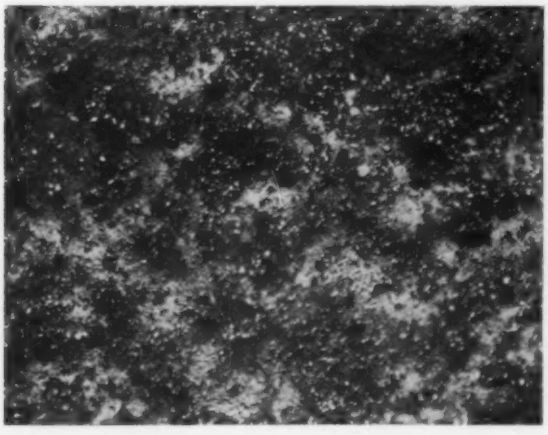
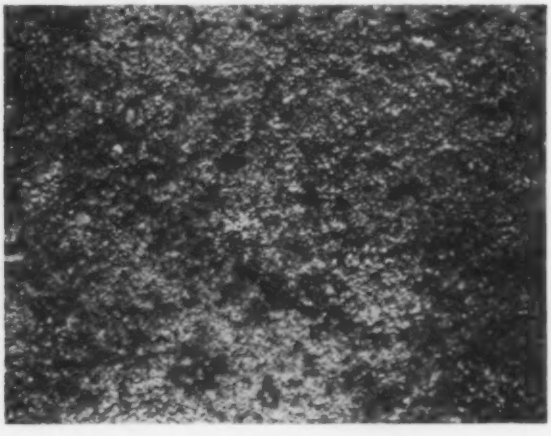


Fig. 10—Kish graphite is absent from this surface of untreated iron poured on an open mold



GATING SHELL MOLD CASTINGS

After certain modifications have been made, general principles employed in the gating of green sand castings also can be used for shell molding. Details are given in this article

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● GENERAL principles employed in the gating of green sand castings also can be used for shell molding.[1] However, certain modifications often are advisable, depending on the choice of pouring arrangement, vertical or horizontal, and the number of casting cavities in a given mold.

An explanation of these modifications can be demonstrated by employing simple hydraulic equations to develop an ideal gating configuration and then by comparing this explanation with practical shell mold systems. Sprue design is controlled by continuity and Bernoulli's equation. Neglecting friction and momentum effects and assuming free fall of the liquid stream, the equations are stated as follows:

Equation 1 $v_1 A_1 = v_2 A_2$

Equation 2 $\frac{v^2}{2g} + h = k$

where:

v = velocity of stream at points 1, 2, etc.
A = cross-sectional area of stream at points 1, 2, etc.
h = hydrostatic head
g = acceleration of gravity
k = constant

The combination of Equations 1 and 2 results in the following:

Equation 3 $A = \frac{F}{\sqrt{2g(k-h)}}$

where:

$F = vA$ (volume flow rate)

Equation 3 describes the cross-sectional area of the metal stream and, therefore, the sprue in relation to the metal head. Accurate calculations can be made with the equation by insertion of a suitable frictional loss coefficient, a desired flow rate, and then determining the sprue cross-section at any point. Sprue taper will not be constant but will be defined by a relation that describes a smooth curve with taper increasing from the bottom to the top of the sprue. Such a configuration minimizes turbulence and aspiration of mold gases.

The metal stream now enters a well at the sprue base empirically designed to maintain a smooth transition from vertical flow in the sprue to horizontal flow in the runner. The method of pouring the shell, vertical or horizontal, will determine the runner type. If the shell is poured vertically, a horizontal runner will be attached to the sprue well, thence into an up runner. In the case of the horizontal pour, the runner will be in the horizontal plane.

In either event, the total runner cross-sectional area will be greater than the cross-section of the sprue at the sprue base. Examination of Equation 3 indicates that the volume flow rate with horizontal pouring will be fairly constant since the hydrostatic head will be partially reduced during pouring, whereas in the vertical pour, the volume flow rate will vary widely with the changes in hydrostatic head.

Illustrate Systems — Characteristics of these two general systems are shown in Fig. 1 and 2 wherein a pouring basin, tapered sprue, sprue well, and runner are shown. Additional features such as selection of sprue and gate dimension are not considered since these items are dependent upon casting size and shape. Let us now examine

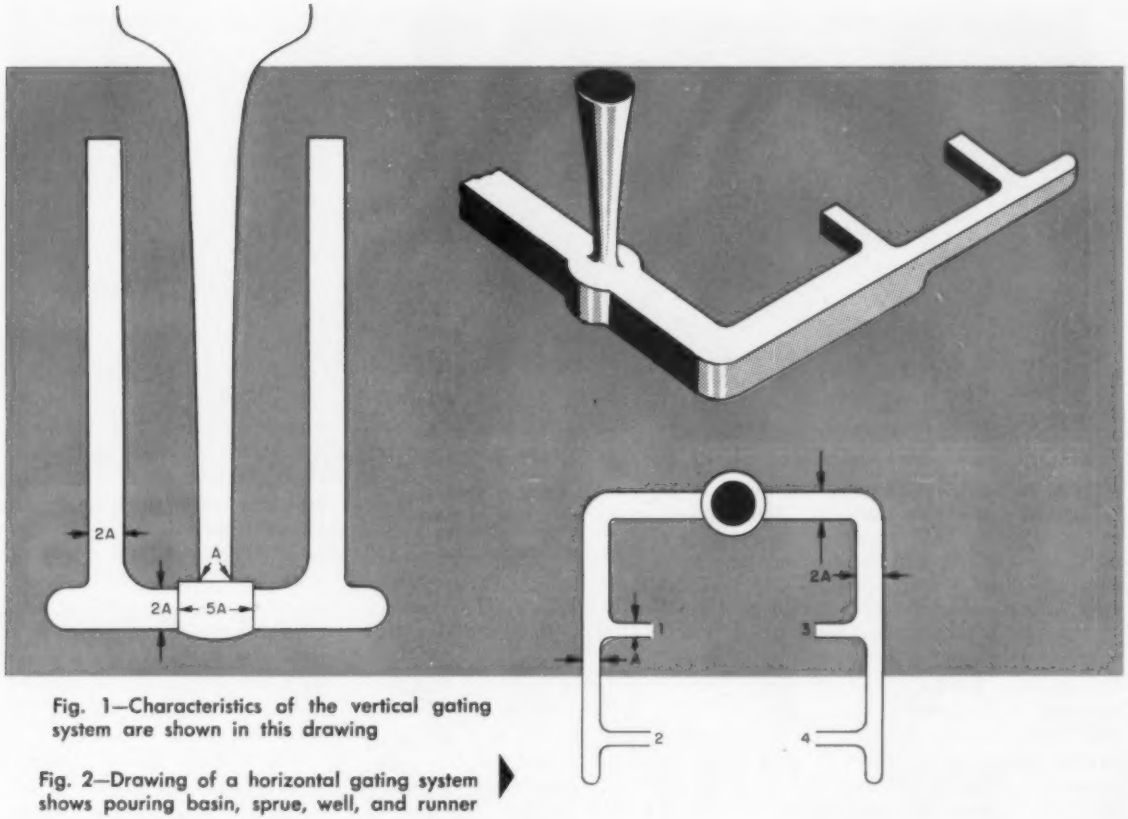


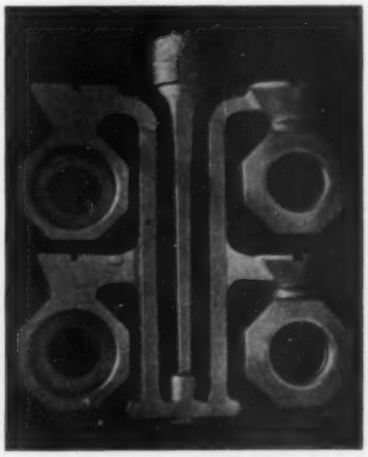
Fig. 1—Characteristics of the vertical gating system are shown in this drawing

Fig. 2—Drawing of a horizontal gating system shows pouring basin, sprue, well, and runner

practical, workable gating systems. Fig. 3 and 4 present two typical configurations for vertical pouring of a shell mold.

There is obvious similarity between these two figures and Fig. 1. The specific features to be noted concerning Fig. 3 and 4 are as follows: The tapered sprue is employed and the metal flow rate is controlled by the cross-sectional area at the base of the sprue. A well is included in the system to prevent turbulence and the vertical runner system with ingates also is employed. The total cross-sectional area of the runners is greater than the choke area at the base of the sprue and in turn the cross-sectional area of the individual gates is greater than the cross-sectional area of its associated vertical runner.

The volume flow of metal into each casting cavity varies as the square root of the pressure head; that is, the time to fill each casting cavity is dependent upon the position within the mold, the upper cavities being filled at a much slower rate than the lower cavities. An additional feature of the system is that the lower casting cavities may fill completely before the upper cavities. The choke area at the base of the sprue is considerably smaller



Walworth Co. photo

Fig. 3—A vertical system like this one is used to cast steel

than the runner and ingate cross-sectional areas. Accordingly, such a simple gravity-feed system can produce the effect described above.

Has Limitations—The technique described above leads, on occasion, to casting difficulties such as laps and cold shuts for the cavities at the top of the mold are slowly filled. This is especially true if the cross-sectional area of the sprue has been decreased to take advantage of the apparent increase in metal fluidity which is attributed to both the smoothness of the shell mold wall and the insulating effect of the gas envelope formed by decomposition of the resin binder during the pouring of the casting. Successful application of this technique requires that the castings can be manufactured at varying flow rates.

If it were decided to have equal flow rates into each casting cavity, a fully pressurized system would be required. The gating system would have to be completely full and the cross-sectional area of each ingate would be proportioned in accordance with the square root of height

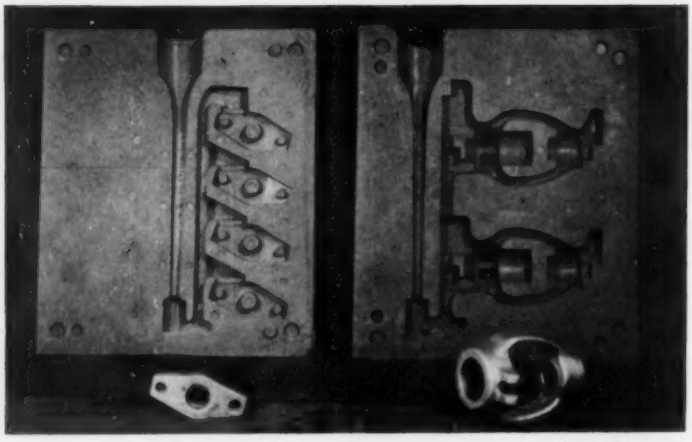


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Fig. 4—Nonferrous castings are made in shell molds using a vertical gating system like this one. Note tapered sprue, well, and runners

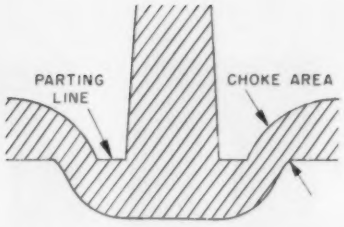


Fig. 6—A sprue well for horizontal gating of shell molds

relationship. The choking system at the base of the sprue would be eliminated, the metal flow rate into the casting cavities would be determined at the ingates. Such a design often produces a high velocity stream which can cause mold erosion and casting rejections. Therefore, the system demonstrated in Fig. 3 and 4 is more desirable and practical.

A major exception to the above can occur in the manufacture of certain steel castings, for the shell mold technique has overriding limitations in such cases. The surface finish of steel castings is marred by the formation of pits at the mold metal interface, probably caused by gas due to resin decomposition. If the resin decomposes before casting skin formation, then the pits will appear.

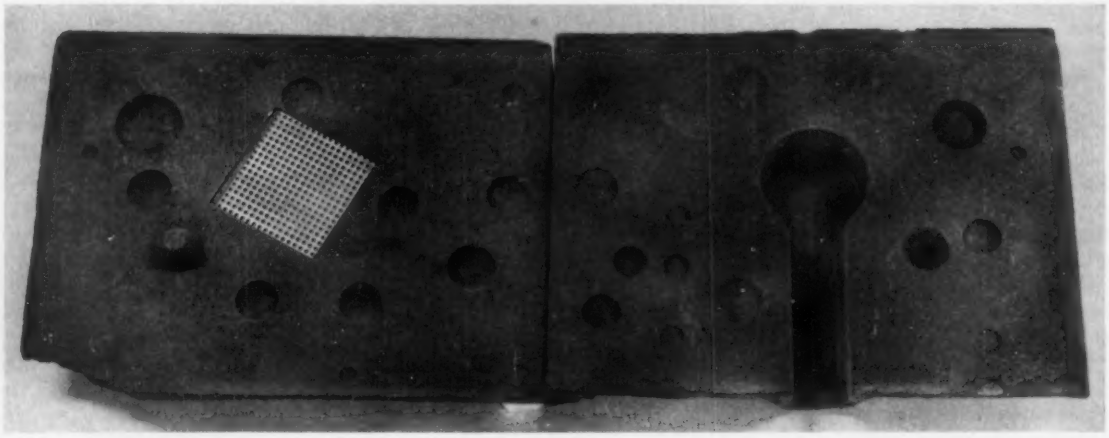
On the other hand, if skin formation occurs before considerable resin decomposition and gas evolution, then the casting surface finish will be improved. Engineering solutions involve the use of chill materials in the mold. For example, shell molds made of zircon sand results in improved surface finish. The use of calcium carbonate[2] in the mold to produce an endothermic heat absorbing reaction promotes skin formation and improves surface finish. Such procedures can be supplemented by pouring the metal at as low a temperature as possible.

Must Alter Gating—To do this the gating system is compromised on many occasions. To pour with minimum superheat and to fill the casting cavities without causing laps and cold shuts may require a so-called wide open gating system. The metal flow rate is not controlled by the sprue base and the pour rate is as rapid as possible. Choosing such an approach to minimize the surface difficulty caused by resin decomposition implies acceptance of other defects arising from the gating procedure.

The vertical gating system usually requires shot back-up of the molds during the metal pour to prevent mold distortion. This requirement is not present in the case of horizontal gating. Accordingly economic considerations often dictate the horizontal pour. This method is not conducive to ideal gating design because geometrical limitations imposed by mold manufacturing procedures preclude the use of the tapered sprue of Fig. 2.

The usual gating technique in-

Fig. 5—To control the flow of nonferrous metals in the gating system, a screen often is placed at the sprue base as demonstrated by this setup



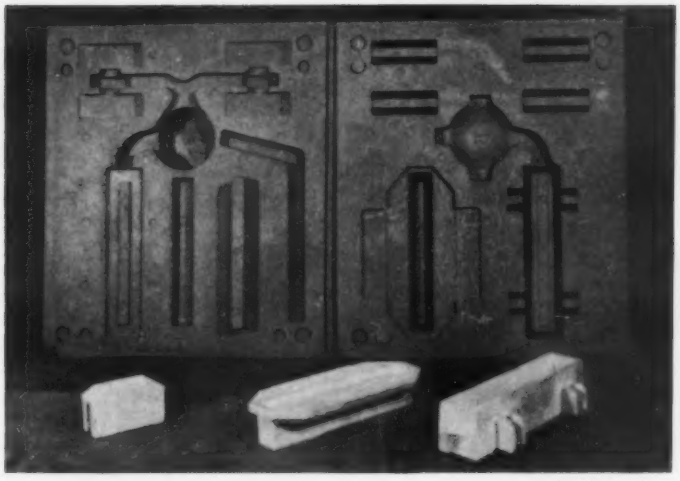


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Fig. 7—This horizontal shell mold gating system is used to gate stainless steel. Metal flow is controlled by the runner assembly

volves an inverse tapered, large diameter sprue or pouring cup plus horizontal runners. The flow rate is determined by the hydrostatic head in the sprue and by the introduction of a suitable choking system at the sprue base.

In nonferrous metals a screen often is placed at the sprue base as demonstrated in Fig. 5. In other cases metal flow is controlled by a runner assembly connected to the sprue well base as indicated in the sketch of Fig. 6. Practical interpretation of this sketch appears as Fig. 7. The sprue cup is located in the left center of the picture while a hemispherical sprue well is located to the right. The molten stream is poured down through the sprue cup into the sprue well and thence up into the runners.

Both of the methods described above tend to entrap slag or dross within the gating system, but the use of a screen or ceramic strainer core seems more desirable since a well can be placed below the screen or strainer. An alternative method wherein screens and chokes are not employed is shown in Fig. 8. Here is a relatively free flow system from the sprue base into large runners thence into swirl-type slag traps and continuing on through runner extensions into the casting.

The runner assembly depicted in the figure is uniquely suited to the pouring of steel castings. Entrained slag is eliminated at the slag traps and also at the runner extensions. In this case there is very little choking of the metal flow. The runners are of large cross section so that the metal can be poured at a low temperature and thus the mold can be filled rapidly to minimize the tendency for pit type defects mentioned previously. The runner extensions incorporated into the gating system also are advantageously employed in horizontal nonferrous gating systems.

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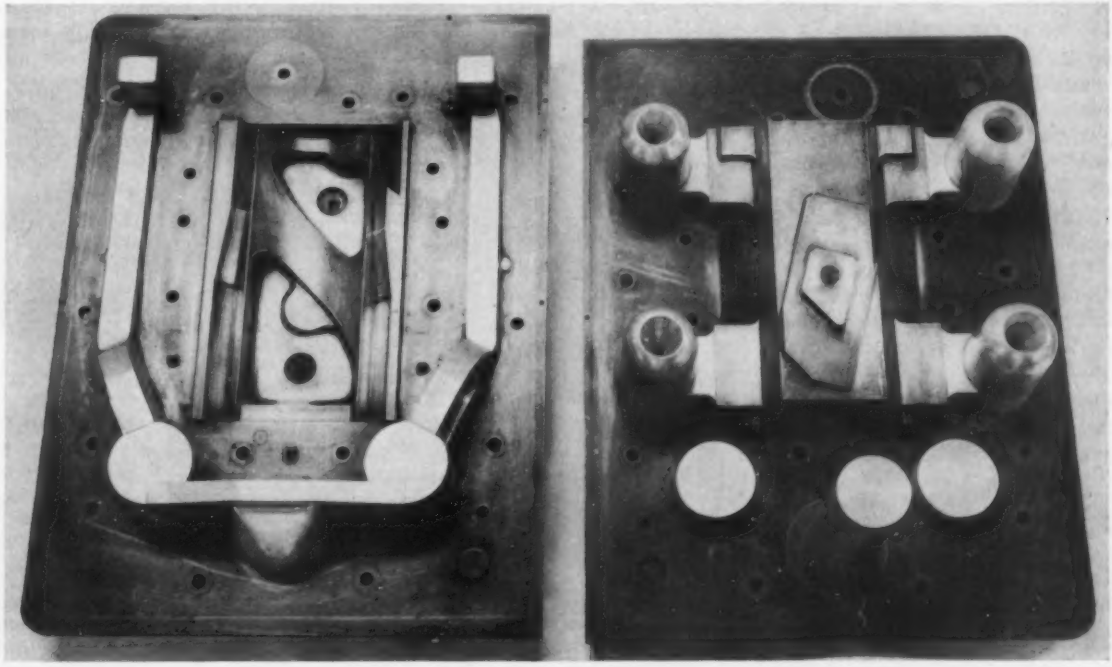
Fig. 8—Matchplate for a rocket slide. This is a relatively free flow system wherein screens and chokes are not employed. It is suited to pouring steel castings



Sales-Minded Foundrymen

By TOM BARLOW
Foundry Products Sales Manager
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Sales-minded foundrymen know that nothing has value until it has been sold, and nothing is sold until it has been produced and delivered. Both functions call for creativity

● RED MOTLEY (an outstanding sales personality) says that nothing has any real value until it is sold. This view can not be disputed; likewise, nothing is sold until it has been produced and delivered.

But there can be a wide range of philosophies of production, ranging all the way from the man who produces—almost against his will—just to get rid of the stupid unreasonable buyer who wants the impossible, to the man who produces because tomorrow his handiwork, his craft, his skill will be a jewel in the crown of the most important man in the world—his customer. This mental attitude actually can influence the sales and, therefore, the success of his company.

Creative Production—We hear of creative selling—even creative buying. My theme is that these functions must include "creative production." To avoid confusion, let's look first at the meaning of the term "creative selling."

One outstanding example was Columbus. He wanted to prove that the world is round. As long as he stuck to what he wanted, he failed. Creative selling was involved, however, when he sold Queen Isabella on the idea that she would be rich when he found a short cut to the riches of India by sailing West instead of using the long, dangerous, overland journey to the East. She put up the dough for what *she* wanted, not for what *he* wanted.

In one sense, of course, this sale never was completed because production failed to produce. The customer didn't get what she wanted, but the salesman had done his job. He died a pauper.

Another outstanding salesman was Sir Walter Raleigh. He wanted wealth and fame for himself. Like Columbus, he used his sales tools on a queen—in this case, Elizabeth I. She wanted a wider empire; so she made a deal. She gave Raleigh Virginia, provided that he would get people to settle there so that she could have a colony. Then Raleigh had another selling job to do.

How would you get people to go to a savage world, just so Elizabeth could have a colony, just so Raleigh could be rich and famous? He was creative! He got a load of tobacco

To convince people to become colonists in America, Sir Walter Raleigh created an English market for an American product—tobacco—by giving it away

This paper was presented at the Foundry Marketing Conference sponsored by Walter Gerlinger Inc. and International Minerals & Chemical Corp., in Milwaukee, Jan. 17.

Some ideas are opposed to market-minded operation. The worst is the attitude that "What was good enough for my grandfather is good enough for me"

from the Indians and gave out free samples in every tavern in London. He taught people to smoke—and they were hooked. It was easy to convince them that when all England was on a tobacco jag, one could get rich by raising tobacco in Virginia. His sales point was to let the Indians do the work and the colonists would make all the money.

Jamestown was founded, and Raleigh was rich and famous—until he was beheaded for failure to deliver. Production fell down. In this instance, it was for lack of creative thinking in handling the labor problem. Labor struck—apparently with tomahawks—and that company failed because of what might be called dead management.

The Problems—Let's look at the subjects with which producers of castings have to spend most of their time:

1. Cupola, air furnace, or electric furnace practice.
2. Molding or sand practice.
3. Gating practice.
4. Coreroom practice.
5. Cleaning room costs.
6. Casting defects—scrap castings.

We need the hundreds of papers and talks and developments that are available on these subjects. But sometimes we get so involved in the trees that we can't see the forest. We can think of these problems almost exclusively as necessary evils —or costs. Or we can consider them as sales tools. Too often we deal only in the first category—cost, problems, worries, headaches. To a great extent, this is a must attitude, part of the daily blood, sweat, and tears. But we also can study the same subjects with slightly modified titles, as follows:

1. How can we provide the customer with the desired physical properties in his castings?
2. How can we provide dimensional control and uniform weight, size, and section in castings?
3. How can we assure soundness and uniform casting density to assure maximum utility?
4. How can we assure the customer clean water or air passages without foreign inclusions and with uniform, predictable dimensions?
5. How can we produce castings with eye appeal?
6. How can we reduce the customer's inspection, machinery, and quality control costs?

These are the same subjects—only now they are oriented to the wants or needs of the customer. I can't give you a magic formula for converting your production to a sales-oriented philosophy, but let's look at some of the factors that sometimes are definitely opposed to a market-minded operation. No one of these ideas is universal—in fact, many foundries already have these problems well under control. Many foundries, however, still suffer from the following handicaps to a greater or lesser extent:

1. *What was good enough for my grandfather is good enough for me.*

This philosophy certainly is opposed to creative production thinking. Let's contrast this attitude with a few examples taken at random during visits to foundries over a period of many years.

A foundry in Ohio did most of its cleaning in tumbling barrels, using cast stars. It mounted a few star patterns on every matchplate so that when the castings were put in the rattlers, the supply of stars automatically was kept in balance. No cost was involved except for the metal because the molding and pouring costs remained unchanged.

During World War II, a piston ring foundry was forced by priority requirements to produce aircraft rings and curtail its output for the replacement auto market. The foundry merely mounted a small auto ring on each larger ring for aircraft and picked up both markets with no loss of priority production and no molding cost.

A foundry in the East, using reversible patterns, rigged all of its work with removable runners so designed that it could mount eight 11 x 14-in. plates in a 22 x 56-in. flask and still have complete versatility. It replaced 11 jolt-squeeze stations with one large machine making 150 molds per day.

When a brake drum foundry decided it was not practical to automate beyond 180 molds an hour, it developed a method for mounting four patterns in a 36 x 36-in. flask instead of using individual flasks 18-in. square. With only 125 molds an hour (and much less downtime and lower maintenance costs), it could produce 500 castings an hour instead of 180.

A fitting foundry found that a change in the sand and the molding pressure permitted 12 characters in a 12 x 18-in. flask instead of 8. Production increased 50 per cent with no increase in molding costs.

This is creative production!

2. *Stupid customers are driving me crazy!*

Some foundries are doing nicely by specializing in the castings that no one else wants to make

This attitude is dying out but still exists. There is enough of it that some foundries are doing very nicely by specializing in producing castings that no one else wants to make. They do it by employing lots of specialized talent and by their philosophy of business. Perhaps they were trained by Boss Kettering, who said, "Bring me only the problems; good news only makes me weak."

Let's remember that one of the virtues we have for sale is that a casting is the only process which can go from raw material to finished product in one step. The "impossible" in other processes is one of our major selling points.

3. *Departmental cost paralysis.*

Here is a tough one. Sure, we must control costs to stay in business. Much of this responsibility falls on the department head. But too often the rules make our overall costs go up or our sales go down. We have seen these handcuffs on more than one department head.

An almost exaggerated (but true, nevertheless) example occurred nearly 20 years ago. A foundry set up a cost system based entirely on the amount of sand in the mold. All savings had to be made by using smaller flasks. This foundry made a variety of rather chunky castings, but the one I have particularly in mind was running about 40 per cent machine shop scrap from leakers. It was easy to prove that the problem was entirely one of cope height. It had only 1½-in. of sand over a 400-lb casting. The plant just couldn't produce uniformly sound castings with so little ferrostatic head.

I saw that foundry run this job at 40 per cent scrap for more than six months because the cost department people would not let it increase the cope height—the switch would have changed their costs. It was cheaper to make scrap than pay the molder a different rate for using the next larger available flask, they said. Eventually the company farmed the job out to a foundry with a different cost system.

Let's take a less fantastic case. A foundry in the East was about to lose its main source of business because the customer was being forced to go to centrifugal castings to minimize excess stock and reduce machining costs. The sales department of the foundry called for help on the sand practice and proved successfully that the castings could be produced to the complete satisfaction of the customer.

The day was saved until accounting reported that the sand costs were up. The sand man was on a budget, and he exceeded it. To avoid losing his job, he went back to his old practice. The foundry started to ship swells and strains again. The customer quit, and the foundry folded. Unfortunately, when the foundry went out of business, the sand man was out of work anyway. Talk about being between the devil and the deep blue sea!

In contrast, let's look at a case reported about 1947 (just to prove that this is not a new idea). This foundry decided to produce a more saleable product. It made changes in the sand and reported that "because the castings are smoother and cleaner, the customers have expressed greater satisfaction with their appearance, and it is believed the castings will machine better." It got a customer benefit, but this time someone was in a position to look at the big picture and the sand man was not put on the spot. The big picture showed the following:

Increased cost of sand	$350.00 a day
Savings in downtime (6%) .	$185.00 a day
Savings in molding time (10%)	$192.00 a day
Savings in cleaning costs (23.5%)	$105.00 a day
Savings in overhead on 16% increased production	$136.00 a day
Net savings	$268.00 a day

And this report does not include the fact that the foundry has tripled its business in the last 13 years because it catered to its customers.

4. *Vice president of nothing.*

One last suggestion—I have heard many foundrymen say, "I would like to make just one-half of what I could save that foundry." Sometimes this is idle chatter, but many times it is true. Years ago, George Cannon said to me, "What most foundries need is a little old lady in the backroom with nothing to do." I needed that explained, and George obliged me.

He described what I could call the Vice President of Nothing. He described a person with no routine duties, no daily responsibilities. This person has only one job: Figure out a better way of doing the every-day job. How can the firm reduce scrap, increase yield, eliminate expensive operations, produce better castings more consistently?

We frequently see foundrymen start such a program, but too often within a short time the man selected is bogged down with a million details, and that part of his job which has to do with nothing starts to get neglected.

It's more than 20 years ago that I first heard about "the little old lady." The way I feel today, I also would hang a sign over her head, a sign that says:

BETTER CASTINGS SELL BETTER

A lot of foundries could use a little old lady with nothing to do except to figure out better ways of doing every-day jobs in the company

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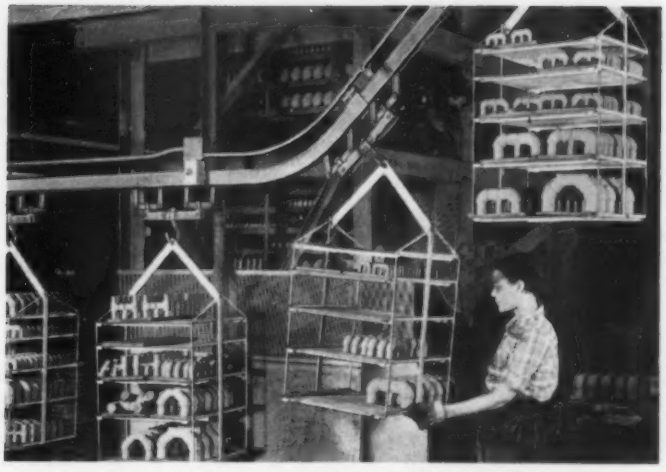
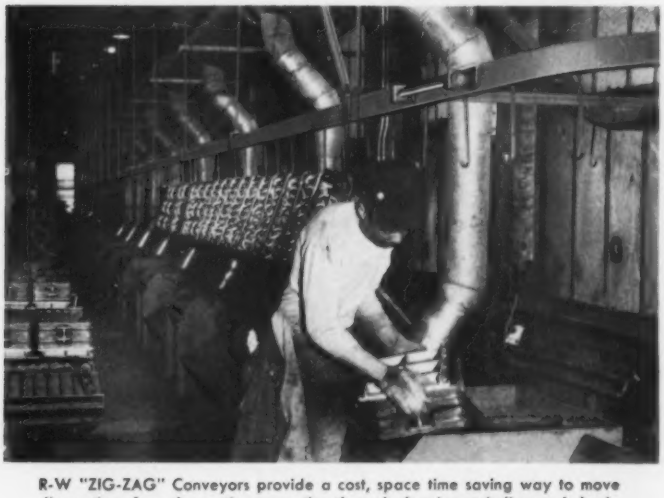


Cores may be efficiently moved to and from the baking ovens and then on to checking benches via an R-W "ZIG-ZAG" Conveyor. Eliminates hazardous lifting and danger of costly breakage.



R-W "ZIG-ZAG" Conveyors provide a cost, space time saving way to move die castings from the casting operation through cleaning, grinding and checking stations and on to shipping. Smooth continuous product flow speeds-up production; eliminates costly bottle-necks.

Speed-up production, cut handling costs, eliminate breakage and increase profits with an R-W "ZIG-ZAG" Conveyor. Unit loads of up to 125 lbs. are carried up, down, in, out and around at a speed to meet your particular requirement. They are strong, flexible, efficient and safe... all moving parts of the chain are fully enclosed and protected from dirt and dust. "ZIG-ZAG" conveyors are economical to purchase... economical to operate and maintain... economical to install. May be installed and later expanded or altered by plant personnel. Write today... request Catalog A-93R.

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Reduce handling costs safely and speed-up production with R-W Crane and Monorail Conveyor Systems. Whether you need a single unit for a specific job or a complete system, R-W cranes and Monorail Conveyors provide smooth, safe ladle handling plus 100% utilization of the pouring area. Transfer cranes with safety interlocks at transfer points provide flexibility and easy handling throughout pouring operations. Let an R-W Sales-Engineer show you how R-W equipment can save you time, money and maintenance costs. Write today for complete information.

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466 W. THIRD STREET, AURORA, ILL. Branches in Principal Cities

For More Information Circle 597, Page 39

QUESTIONS and ANSWERS

- **Metal chill can be placed in shell mold for production of dense bronze gears**
- **Green strength decrease in core mixtures held overnight is caused by moisture loss**
- **Increasing strength in base iron for just a few castings requires some experimentation**
- **Erosion of cast iron stopper plug is due to a combination of solution and cutting action**

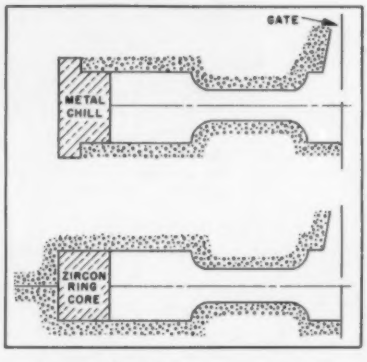
Shell Molding Gear Blanks

We produce copper-base and aluminum-base alloy castings by the shell molding process, and would like to know whether it is possible for us to make bronze gear blanks with chilled faces of a specific depth. We have been using 5 to 10 per cent zircon sand in our mix and obtain a slight chill.

So far as we can see, there is no reason why you cannot adapt the shell molding process to produce chilled-face bronze gear blanks. Two possibilities come to mind, and those are shown in the accompanying sketch. One shows the use of a metal chill which you could make in your foundry from bronze, and the other employs a zircon sand ring core. As you can see, changes will have to be made in the pattern equipment to accommodate the chills.

Although we indicate insets in the surfaces of the metal chill to accommodate the shell portion, the arrangement can be the same as indicated for the ring core, and vice versa. With the arrangement shown for the metal chill, the shell portion and the chill are joined with resin adhesive, as would be the case with two shell molds, but the metal chill will have to be heated to 200° F or more to insure curing of the adhesive employed.

Prior to use, the metal chill should be given a thin coating of graphite or other refractory to eliminate any possibility of the casting's sticking to the chill. We believe it is preferable to purchase the mold coating rather than to try to compound one of your own. Usually the chill is heated when the coating is applied, and heating is essential if the coating has a water vehicle. Also, the chill preferably is used at a temperature above the boiling point of water to prevent pickup of moisture.



Proposed chilling arrangements

We assume that the reference to depth of chill pertains to a minimum rather than a fixed value—that is, the customer wants the chilled portion to extend as deep as the tooth root. To meet such a condition, you will have to do some experimental work to determine whether it can be accomplished.

It is our opinion that for concordant results you will have to establish the temperature of pouring and temperature, and thickness of the chill. As far as the latter is concerned, we do not believe that anything will be gained by making the chill any thicker than the section to be chilled.

Mix Loses Green Strength

We have noticed that our core sand mixtures containing corn flour have sufficient strength when used the first day. Often all the sand is not used, however, and we store the remainder in closed containers to avoid loss of moisture. The following day the mix has considerably less green strength, and as time goes on it loses more and more strength. Is this loss a common thing, and are there any preservatives which will prevent the loss?

We believe that your difficulty in loss of green strength is due to loss of moisture, but that only can be ascertained definitely by determining the moisture contents of the sand at the two stages. Placing the sand in closed containers will reduce moisture loss, but will not prevent it unless the containers are air tight. It might be pointed out that exposure of sand to the atmosphere during use results in loss of moisture, and the loss will depend on the length of time of exposure, the surface area exposed, and the relative humidity. It increases with length of exposure and increased surface area, and decreases with high humidity conditions.

There is no doubt that the leftover sand is lower in moisture than when it first was placed in use and that during the overnight storage it loses sufficiently more to cause trouble. Core sands are relatively

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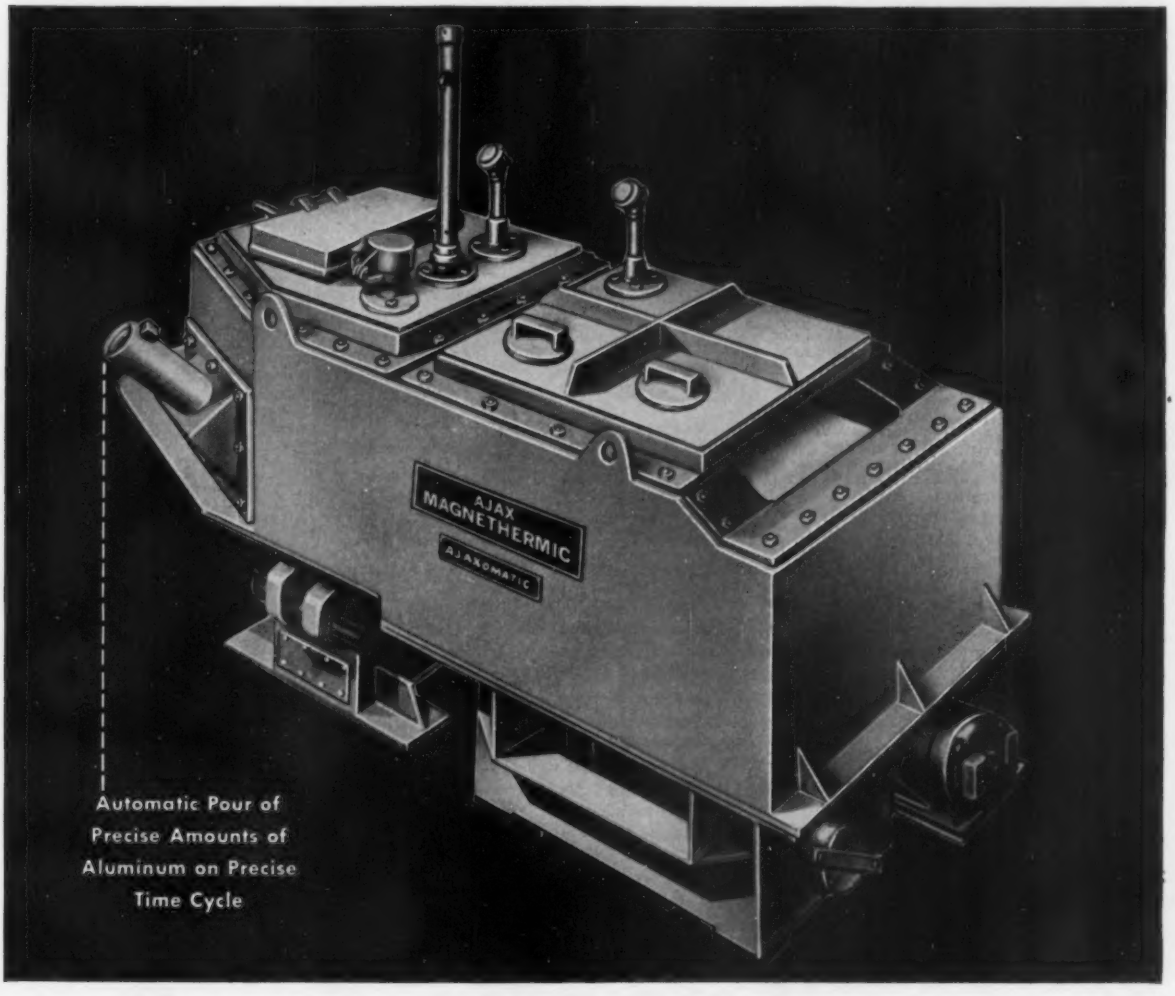

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low in moisture content to start with, and an apparently slight loss can result in a large effect on properties.

Loss in moisture can be minimized by covering the stored sand with wet burlap bags. Some success also has been attained in decreasing moisture loss or drying out by the addition of various agents which lower the vapor pressure of water. These include lithium chloride, glycerine, ethylene glycol, sulfite pitch or lignin, possibly sodium chloride, and ammonium nitrate. The latter in solid form as crystals or powder is classed as an explosive and must be handled accordingly. Amounts required for the additions depend on the moisture loss and will have to be determined by experiment. Indications are that 1 or 2 per cent should serve.

Wants Higher Strength Iron

We are producing a line of gray iron castings from charges composed of 45 per cent pig iron containing 3 per cent silicon, 25 per cent steel rails, 20 per cent returns containing 1.9 per cent silicon, and 10 per cent purchased scrap which gives an iron with a tensile strength of about 24,500 psi.

We need some iron with a tensile of 30,000 psi or better for a few castings and have tried adding 1 per cent of a silicon-chromium alloy in the ladle. However, that step increased the tensile strength to only 28,400 psi. What should we do to obtain the desired results?

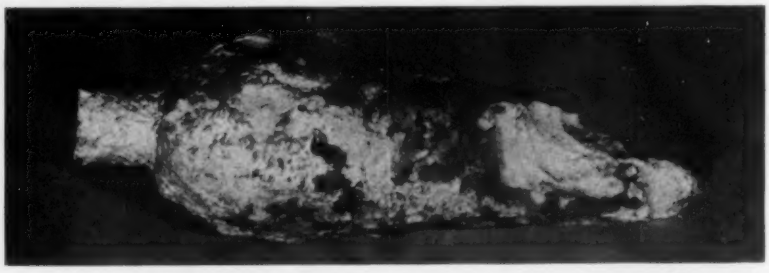
According to your statements the addition of 1 per cent of the silicon-chromium alloy resulted in an increase of approximately 16 per cent in tensile strength, and if an increase in the addition would function as effectively, then 1½ per cent should enable you to obtain a tensile strength slightly above 30,000 psi.

No mention is made on whether machinability is a factor in the higher strength castings, and there is a possibility that the increase in the silicon-chromium alloy might cause some difficulty. The only way to find out would be to make the indicated addition and observe whether the desired increase in strength is obtained, and how machinability is affected.

If trouble with machinability is encountered, then some other alloy addition will have to be made in combination with the silicon-chromium. Investigation by Schneidewind and McElwee some years ago indicated that molybdenum was quite effective in increasing strength of gray iron, and suggested a factor of 40 per cent increase for 1 per cent molybdenum. On that basis the addition of 4 oz of ferromolybdenum per 100 lb of iron in addition to the 1 per cent silicon-chrome alloy should give the desired results.

Molten Aluminum Erodes Plugs

We are sending to you a cast iron furnace plug which is employed by one of our customers to regulate the flow of molten aluminum from the furnace into billet molds. The plug and part of the steel rod forming the handle are immersed in the aluminum during use. You will note that considerable erosion has occurred on the tip, but is not confined to any particular area.



Cast iron stopper plug is eroded badly by flowing molten aluminum

The same thing applies to the steel handles; some erode badly and others do not.

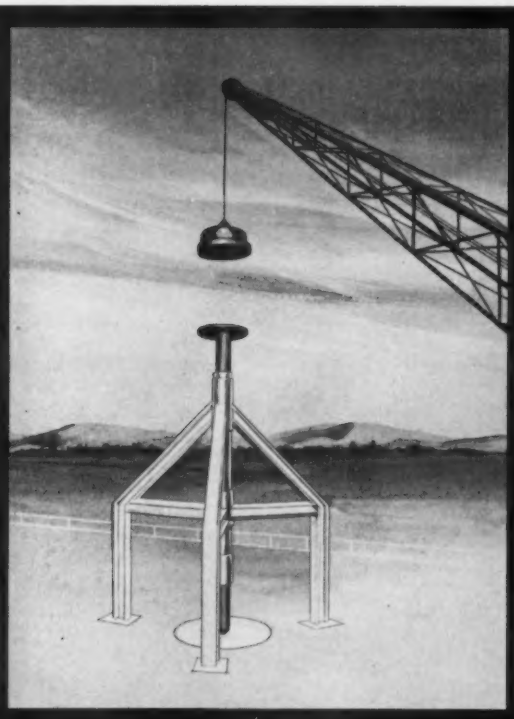
Although we use a cupola for our regular gray iron castings, we prefer to melt iron for the plugs in a crucible using soil pipe scrap. We realize that this composition is not heat resistant, but consider our problem to be one of amalgamation or affinity of metals for each other at elevated temperatures. Average life of the plugs is 17 to 20 tons, but our customer is asking us for more durable plugs and rods if possible. Do you have any suggestions on the iron or perhaps some non-foundry material?

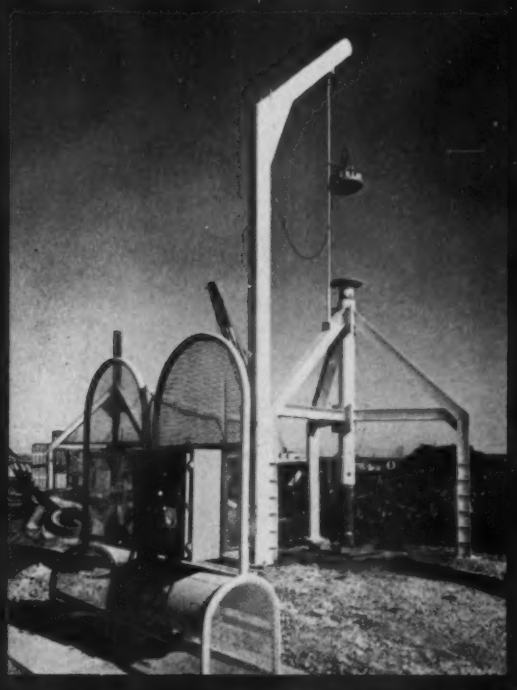
As you indicate, the problem with the gray iron plugs and steel rod handles is one of the iron and steel being dissolved by the molten aluminum, and that process is intensified by the washing or eroding action of the flowing stream of metal. As you undoubtedly know, gray iron pots commonly are employed to melt aluminum-base alloys, but in such application the metal is static, and additionally the iron is protected by a thin refractory coating.

There is no doubt that a refractory coating on the plugs and handles would provide extended life, but we do not know of any specific method of application which would insure resistance to the erosive action of the flowing metal. You might try a material commonly used for coating molds and pots which is composed of 1 gal water, 12 oz sodium silicate (40 per cent), 10 oz whiting, and 1 oz graphite. Water is brought to boiling and the ingredients added. Mixture is allowed to cool before use, and must be stirred well. Possibly better adherence might be attained by baking the coating at high temperature.

Perhaps a plug with longer life can be obtained by adding chromium to the iron, but we do not know definitely whether such an addition would prevent the erosion. We suggest the addition of 1 per cent chromium, which can be obtained by adding about 1½ lb ferrochromium to 100 lb iron. The addition of chromium will increase the cost of your product, and that would have to be considered in relation to any increase in life.

Since the problem is one of solution and erosion, it might be worthwhile to consider, as you suggest, some other material for the plugs. Possibilities that come to mind are graphite, silicon carbide, and nitride-bonded silicon carbide in solid form. Perhaps a refractory such as firebrick might serve. Again a castable refractory might be shaped in a suitable mold.





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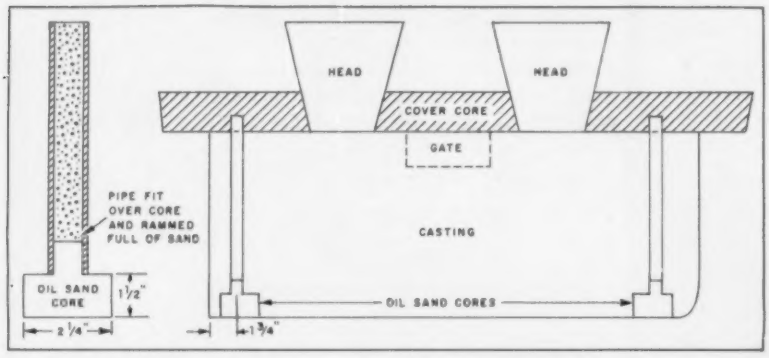
Pipe Core in Heavy Section

We are casting 3000-lb counterweights about 27 x 36 x 13 in. with 1⅛-in. bolt holes in the corners, 1¾ in. from the edges. Due to the small diameter of the holes, we have been using 1-in. black steel pipe filled with sand. Our problem is that iron gets into the pipe in some manner, forming a hard mass in the pipe which is extremely difficult to drill out. The pipe does not melt.

We have tried various washes inside the pipe, as well as silica and carbon sands for filling, with the same results. The core, as shown in the sketch, is combination of a dry sand core to form the bolt head recesses on which the pipe is mounted and rammed full of sand.



Steel pipe filled with sand to form cores in heavy casting causes problem

Some times the dry sand core is unaffected and the sand in the pipe a solid mass. Other times, the sand core is badly penetrated by the iron, and the mass fills the bolt head recesses.

Your difficulty with the sand forming a hard mass in the pipe evidently is due to a reaction between the iron oxide coating on the pipe interior and the sand as a result of the high temperature conditions. One possibility is that the carbonaceous gases generated by contact of the metal pass up through the pipe and reduce the oxide to metallic iron, which penetrates the sand. The other is that under the high-temperature condition of the pipe, the oxide itself reacts with the silica sand to form an iron silicate. That point would not apply, however, in the case where carbon sand is the filling material.

Two remedies are possible. One is to try the use of galvanized steel pipe instead of the black pipe. The other is to change the design or arrangement of the piece of pipe and the recess core so that gas generated in the core will not pass up through the pipe. That change can be accomplished by making the recess core with a hole of the proper size to accommodate the pipe. Cut the pipe length so that it will rest on the drag. Drill a hole through the iron pipe just at the top of the core and insert a nail to keep the recess core from rising.

Since you drill out the opening, it seems to us that it would be worthwhile to try using the pipes without filling them at all. You might use extra-heavy pipe if you are afraid that it might collapse under the metal pressure. We do not believe, however, that collapse will occur with standard pipe.

With reference to the cored holes, the thought occurs that the necessity of drilling or boring the holes might be eliminated if a suitable refractory coating could be applied to the pipe exterior and, after the counterweight has solidified, the pipe could be extracted, leaving the desired hole. Problem would be to insure that the coating adheres tightly without spalling or flaking off.

One method might be to coat the pipe with a solution of water glass, or sodium silicate, then roll it in silica or zircon flour or fine dry sand until it is covered thoroughly. Coated pipe then is baked to remove excess moisture. Possibly a better idea would be to coat with silicate and then wrap with one or two layers of thin asbestos paper. Before trying those out in the counterweights, you could make up an open mold with a cavity 6 or 8 in. square and 14 or 15 in. deep and observe the results.

Penetration of the dry sand core forming the bolt head recesses may be due to underbaking, too coarse sand, or perhaps cracking resulting from ramming up sand in the pipe after placing on the core.

Annealing Boxes Resist Heat

We operate a gray iron foundry and are considering the production of annealing boxes for heat treatment of malleable iron castings. Can you tell us what analysis generally is used and, if necessary, what alloying agents can be added in the ladle?

Annealing boxes or pots for heat treatment of malleable iron are subjected to severe service by being raised to high temperatures and then cooled. Resistance to oxidation and growth is a principal requirement. Such boxes often are made by the malleable foundry from the same iron used for castings, and this composition produces white fracture material. With cupola melted iron, one with a silicon content under 1.0 per cent and a total carbon of approximately 3 per cent should serve.

You will be much further ahead by making up a high-steel scrap charge and placing it in the cupola just for the pots rather than trying to make ladle additions to your regular gray iron. Preferably the high-steel mix charge would be the first in the cupola, and separated from the succeeding charges of your regular mixture by a double coke split. The double coke split will slow down the melting rate and thus indicate the change from one mixture to the other. Even then it may be advisable to pour the first metal after the change into castings where composition is not important.

If you prefer to make a ladle addition, you will have to use a strong carbide stabilizer such as chromium, and the amount will depend on the silicon content of your regular mixture. It is our impression that your castings are light in section, calling for relatively high silicon. Therefore, we suggest an addition of at least 0.50 per cent Cr, but preferably about 0.70 per cent, and observe the results obtained through fracturing the sections. Structure should be on the white side. In any case it will be advisable to conduct some experimental work for best results.

Circle 600, Page 39→

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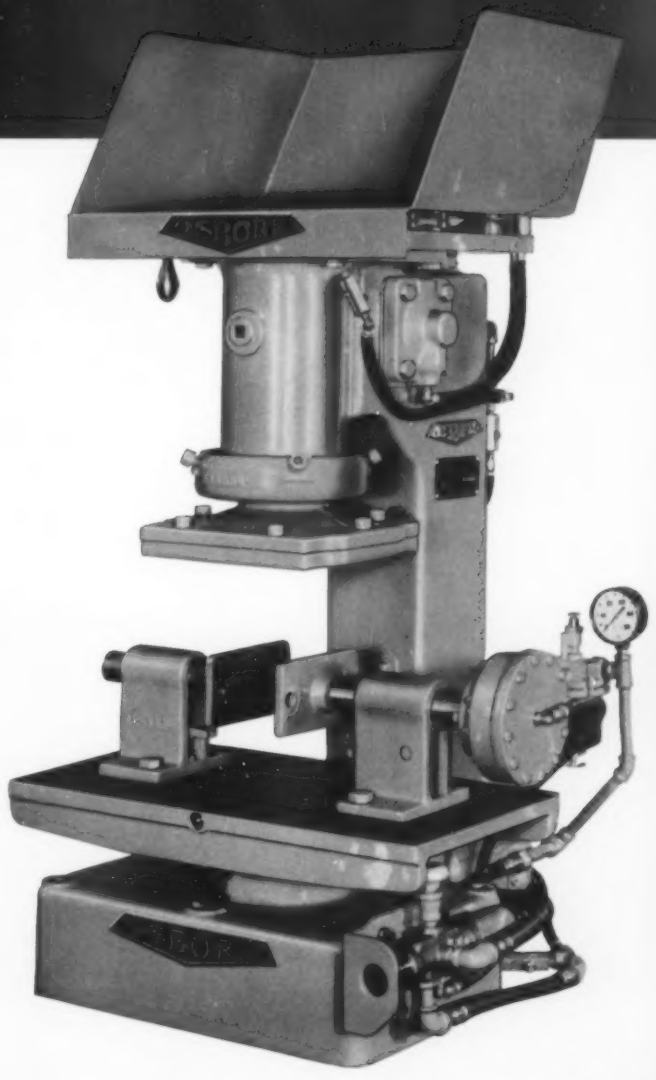
JET-CORE BENCH CORE BLOWER

fast . . . compact, flexible unit produces high quality cores



The Osborn No. 905 *Jet-Core* Bench Core Blower is an ideal unit for fast, low cost production of superior quality small cores. Simple and convenient to operate, this versatile machine adds flexibility and precision to core room operations in production, semi-production or jobbing foundries. Designed for long, trouble-free service, it combines the latest core blowing advances with Osborn methods proven by years of reliable performance.

Intricate cores are no problem because of the *Jet-Core* perforated blow sleeve design. The blow sleeve eliminates channeling or cratering of sand in the reservoir. Result is "fluid action" and free flow of sand during the blow cycle.

The sturdy, cast post also serves as an air reservoir to provide a large volume of air for the blow operation. This surge of air insures complete filling of the core box and produces cores of excellent density.

Fast cycling . . . simple push-button operation . . . single-point lubrication . . . rugged, simple construction . . . low maintenance—all add up to dependable, low cost core production and higher foundry profits.

OPERATING AND PERFORMANCE FEATURES

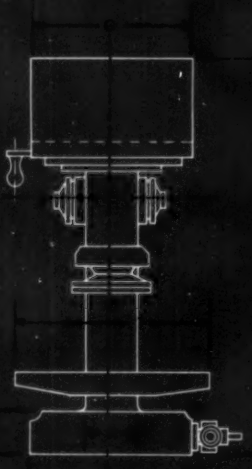
- Quick-change blow heads and blow plates speed set-up . . . increase core room flexibility.
- Automatic, single push-button operation.
- Table height readily adjustable to handle a wide variety of core box sizes.
- Improved jet action blow.
- Large valves permit fast air passage.
- High-speed machine cycle time—2-3 seconds.
- Stationary head . . . no reservoir movement for filling.
- Horizontal clamp is quickly adjustable to various core box widths.

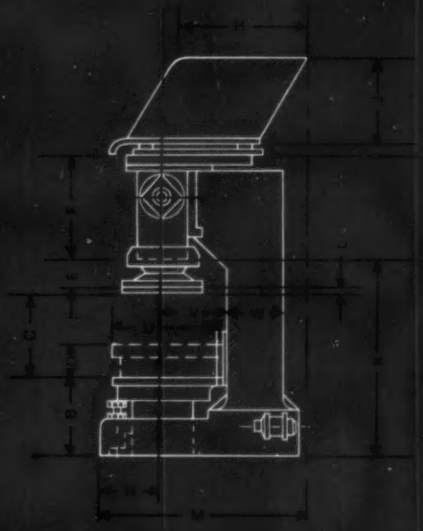
CORE BLOWER, BENCH TYPE

Compact, simple to install, easy to operate —this Osborn 905 Art-Core Bench Core Blower adds speed, convenience and precision to core-making operations in a leading iron foundry.

SPECIFICATIONS	Model 905
Table Size	12″ x 22″
Vertical Clamp Piston Diameter	5″
Core Box Space (Adjustable)	
Maximum	10 9/16″
Minimum	6 9/16″
Reservoir Capacity	6 lbs.
Air Inlet Supply	3/8″ P.T.
Standard Reservoir Opening*	6 3/4″ x 6 3/4″
Domestic Shipping Weight	850 lbs.

*Specials available





DIMENSIONS

MACHINE NO.	A	B	C MAX.	C MIN.	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W
905	19 1/2	19 1/2	29	19	12	12	2	2	9	9	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2

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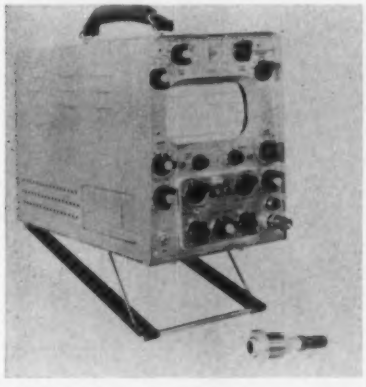
ULTRASONIC FLAW DETECTOR

Ultrasonic flaw detector called Metalloradar features a synthetic membrane which fits over the unit's transducer, doing away with the

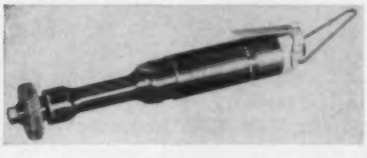


need for a liquid coupling. The membrane serves as a protective skin to avoid damaging wear to the face of the transducer crystal caused by friction with objects tested. A high degree of sensitivity, comparable to most conventional flaw detectors used today, is claimed for the unit, but a liquid coupling can be used for even greater sensitivity. Attachments for direct numerical readout are available for flaw detection or thickness measurement. A novel marker system on the monitor screen gives easier readout of distances by means of pips on a separate sweep.—**Circo Corp., Ultrasonic Div.**, 51 Terminal Dr., Clark, N. J.

For More Details Circle No. 451—Page 39

PNEUMATIC GRINDERS

Series 922 includes 27 models of long-type small wheel pneumatic

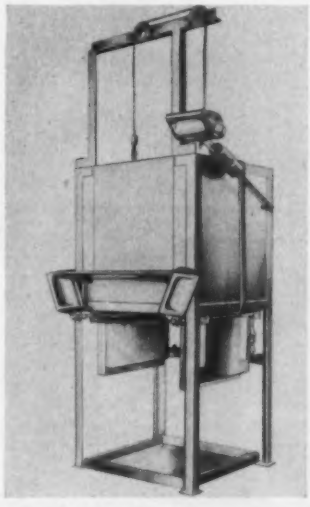


grinders developed for grinding into deep recesses and for two-hand operation. Speeds available range from 12,000 to 25,000 rpm and are provided by company's swastika-type motor. The arbor is mounted on two widely spaced bearings. A choice of lever, pushbutton, and ring throttle models is offered. Six models are furnished with governors for work requiring constant speed and power.—**Thomas C. Wilson Inc.**, 21-11 44th Ave., Long Island City 1, N. Y.

For More Details Circle No. 452—Page 39

SHELL INVESTMENT UNIT

Furnace is gas-fired and is designed for firing all shell investment casting molds at temperatures up to 1800° F. Floorspace of 46 x 46 in. is required for the unit, which features a firing chamber 18 x 18 x 18 in. surrounded by insulating



brick 4½ in. thick at the back, top, and sides. A vertical sliding front door is counterbalanced. Counterweighted drop-bottom trapdoors are hinged from the sides. Opening the trapdoors allows molten wax to drop into the water-filled pan below the furnace.

The furnace is constructed of sheet steel with a heavy angle-iron frame and has indicating pyrometer and alloy grid hearth.—**Alexander Saunders & Co.**, 95 Bedford St., New York, N. Y.

For More Details Circle No. 453—Page 39

CHIPPING HAMMER

Chipping hammer features uniform heat treatment throughout and is said to stand up under at least twice as many sharpenings as ham-

mers with heads tempered only at the working ends. Hammers also feature hand-contoured wooden handles.—**Chicago Mfg. & Distributing Co.**, 1920 W. 46th St., Chicago 9, Ill.

For More Details Circle No. 454—Page 39

FUEL-AIR MIXING UNIT

Small fan-type mixer produces an air-gas mixture and delivers it under pressure to a burner or series of burners for small industrial heating applications or installations where a blast pilot is desired and no other source of air pressure is available. Unit is less than 6½ in. in diam, yet, is designed for firing installations requiring inputs up to 215,000 Btu per hr. Inlet gas pressure of 4 in. of water is adequate to give full rated capacity. Firing can be at a fixed rate or controlled automati-

cally by an on-off solenoid valve. Other features include a cast aluminum mixer housing, an open-

←Circle 600, Page 39

frame, 1/25-hp motor, an adjustable disc-type shutter, and an adjustable gas input orifice.—**Eclipse Fuel Engineering Co.**, Rockford, Ill.

For More Details Circle No. 455—Page 39

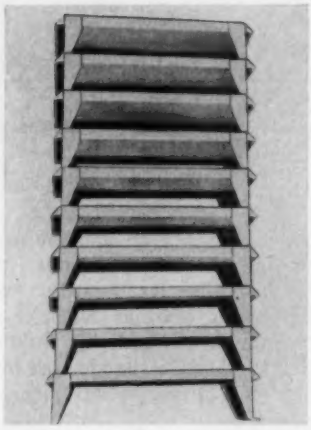
ELECTROLYTIC MANGANESE

New grade of electrolytic manganese is designed principally for needs of stainless steel producers who prefer to keep hydrogen levels in finished metal at a minimum. The low hydrogen grade typically analyzes about 40 ppm hydrogen and is guaranteed to contain fewer than 50 ppm.—**Foote Mineral Co.**, 18 W. Chelten Ave., Philadelphia 44, Pa.

For More Details Circle No. 456—Page 39

CORE TRAYS

Core trays are designed to lock together when stacked for storing cores. They also can be used for



baking the cores. Made of 16-gage steel, the trays are 12 x 24 in. with a loading height of 4½, 6, or 7 in. The trays also can be made to customer's specifications.—**Arco Welding Service**, 4727 S. Hoyne Ave., Chicago 9, Ill.

For More Details Circle No. 457—Page 39

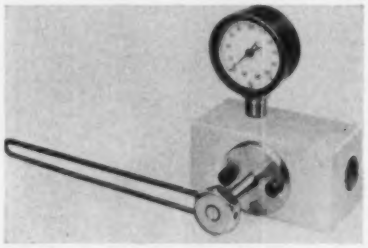
HAND TRUCK

Two-wheeled hand truck is completely collapsible, yet can lift 500 lb. Unit is constructed from 6062-T6 aluminum extrusions and weighs less than 10 lb. Erected truck has 14-in. base and adjustable 57-in. handle; the folded unit measures 6 x 36 in.—**Sturgis Mfg. Co.**, Paxtun, Colo.

For More Details Circle No. 458—Page 39

OIL VALVE

Oil valve, Model 4-P, is designed to increase efficiency, reduce fuel consumption, and cut maintenance costs for oil burner heating systems. It works with 4, 5, and 6 oils and



can be operated manually or automatically. Body of the unit is machined brass, and use of only one moving part insures against loss of adjustment. — **Dawson Enterprises**, 631 Central Ave., East Orange, N. J.

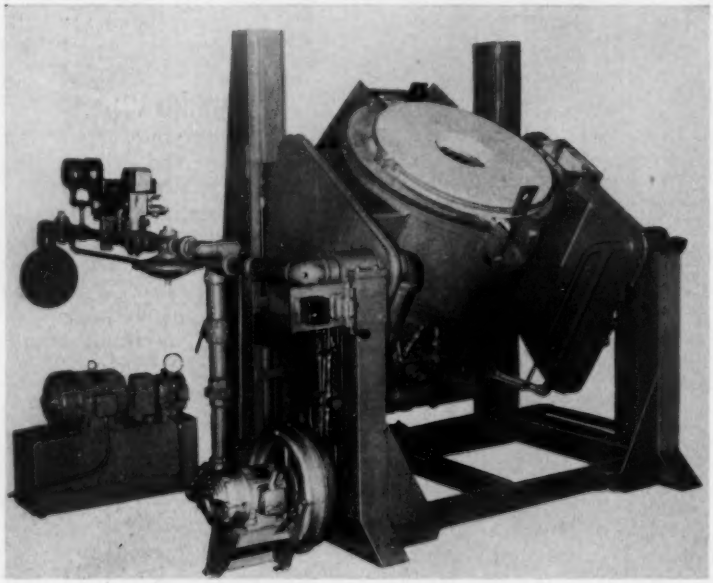
For More Details Circle No. 459—Page 39

POTENTIOMETER

Potentiometer, the Electronik 17, features an electromechanical strain gage as a balancing element instead of the conventional slide wire arrangement. Limitations of the slide wire balancing element, such as mechanical wear, limited resolution, and bounce at high operating speeds, are said to be eliminated. Three models are available, each mounted in a standard case which measures 11 x 13¼ by 16 19/32 in. Strip chart recorder will record continuously for 31 days; circular chart recorder will record continuously for 24 hours; and circular scale indicator will read continuously. Each model can serve as a controller.

Modular construction allows interchangeability of display, drive, and case modules from the three models. Additional features include one-month ink supply, full scale travel between 1 and 15 sec depending on model, changeable

Melting Furnace Has Special Pouring Lip



Nose-pour crucible furnace for melting aluminum features a stationary lip which assures a constant pouring arc. This feature eliminates the necessity of moving the ladle at the furnace front during the entire pour. Known as Model WCT, the unit is offered with either hoist or powered (mechanical or hydraulic) tilting mechanism. Capacities available range from 125 to 2000 lb of aluminum, and firing can be accomplished by oil, gas, or combination oil-gas burners. Heavy construction, temperature controls, and combustion safeguards are added features.—**Warwick Industrial Furnace & Engineering Co.**, 452 W. Chicago Ave., Chicago, Ill.

For More Details Circle No. 482—Page 39

CAUTION! CASTINGS...HANDLE WITH GO-DEVIL BY DROTT

In a foundry, any damage to a casting can mean an expensive piece of scrap. That's why this foundry specifies the new 60 RM 2 Go-Devil for a large part of its handling operations.

Go-Devil's gentle and positive handling of loads up to 6000 lbs. means safer, more efficient transport of any type material in any part of the factory or yard. Give it 74" of aisle space and watch Go-Devil cut your materials handling costs.

The 360° rotating boom telescopes out and over... out to 16' to pick up castings, scrap barrels, cores or molds even in normally inaccessible areas. The 8000 lbs. capacity, 50 sq. foot deck area permits stacking and carrying of any material without using the hook. The compactness and close-quarter power steering of the Go-Devil get it in and out of tight spots with amazing ease.

Isn't all-around materials handling versatility, precision and safety important to your production picture? Then the answer is Drott Go-Devil. Fill out the coupon below now. *Ask about the 20 RM 2 Go-Devil, too!*

IT REACHES	IT LIFTS	IT SWINGS	IT TRAVELS	IT HAULS
24' up . . . 16' out	6000 lbs. with safety	360° continuous rotation	up to 19 MPH	on 50 sq. ft. of deck area

DROTT
MANUFACTURING CORP.
Milwaukee, Wisconsin

CLIP AND MAIL TO

DROTT MANUFACTURING CORP.
Materials Handling Division
3126 S. 27th Street • Milwaukee 15, Wisconsin

I'd like more information on the 60 RM 2 Go-Devil.
Please rush bulletin MH600.

Name.....

Title.....

Company Name.....

Company Address.....

City.....Zone.....State.....

For More Information Circle 601, Page 39

operating range, constant current supply unit which eliminates need for standardization, 2-phase induction balancing motor, and rated ambient temperature range of 30 to 110° F.—**Minneapolis-Honeywell Regulator Co.**, Wayne & Windrim Avenues, Philadelphia 44, Pa.

For More Details Circle No. 460—Page 39

MICROSCOPES

Laboratory microscopes feature a completely integrated zoom optical system. Known as the Dynazoom series, this group features a choice of six interchangeable bodies, all of which fit on a common stand. The series includes three monoculars, a binocular, a photo-binocular, and a photo-monocular. Stage focusing is used to allow the eye level to remain constant. Magnification range

of the series extends from 17.5X to 1940X. New 35-mm and Polaroid Land camera attachments, as illustrated, are available. Illuminator accessories include a mirror for use with separate light sources, Opti-Lume for routine visual examination, or a variable power built-in base illuminator for bright field, dark field, phase contrast, and photomicrography.—**Bausch & Lomb Inc.**, Rochester 2, N. Y.

For More Details Circle No. 461—Page 39

DRUM HANDLER

Drum handler, known as the Kughler Openhead Drumaster, is designed to handle 55-gal steel drums

with open tops. Unit can be slipped on forks of any model or make of lift truck. Gripping head consists of a hook and jaw which automatically grips the drums below the rim. An actuating drum support plate at the base of the attachment activates the gripping jaw. Loads are released only when the drums have been set down. Driver of the lift truck never needs to leave his seat. Capacity of the unit is 2000 lb.—**Little Giant Products Inc.**, Peoria, Ill.

For More Details Circle No. 462—Page 39

RUST PREVENTIVE

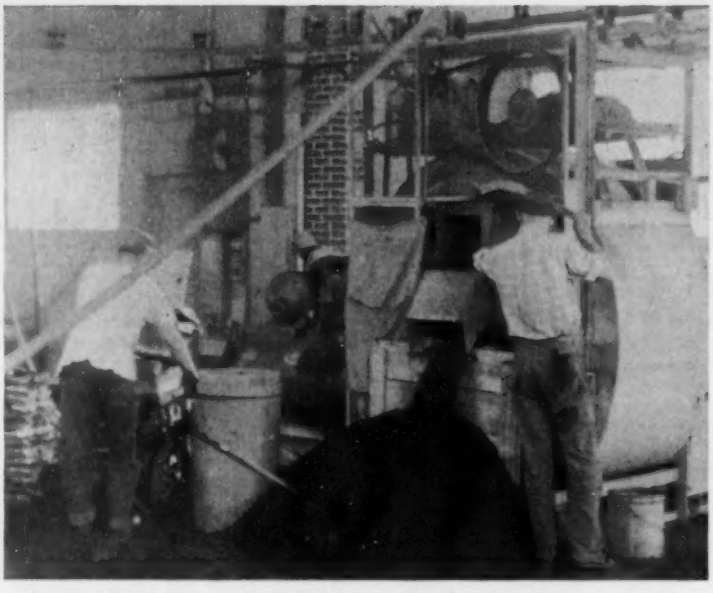
Plastic dry film rust preventive, Rust Veto 342, protects metal surfaces outdoors or indoors, even when the coated object is exposed to salt water. Material provides a clear coating so that painted or stamped numbers are visible. It will not crack or flow from −40 to 175° F. Solvent or mild alkaline cleaner is used to remove the product from protected surfaces.—**E. F. Houghton & Co.**, 303 W. Lehigh Ave., Philadelphia 33, Pa.

For More Details Circle No. 463—Page 39

SWING FRAME GRINDERS

Line of swing-frame belt grinders includes 20 different standard models in medium, heavy, and extra-heavy duty and G and P series.

Portable Muller Operates in Vertical Plane



Ringmullor is a sand preparation unit which operates in a vertical plane. Molds are dumped onto a vibrating screen to separate sand from castings, tramp metal, and other foreign matter and to break down lumps. Sand passes into a revolving steel pan or ring where it is mixed and mulled by rubber wheels and plows. Continuous aeration is provided by a driven, revolving drum with many spring steel fingers for combining the sand as it is being processed.

When mulling has been completed, actuating a lever causes a plow to divert the sand from the muller onto the floor beside a molding station or into an elevator. The muller can be mounted on a monorail system, like the 500-lb unit shown, or on wheels. —**States Engineering Corp.**, 245 E. Murray St., Fort Wayne, Ind.

For More Details Circle No. 483—Page 39

coke...carefully hand-picked...
to give you better melting in your cupola

Every foundryman knows how important *uniform coke size* is to a successful melting operation. Size bears a close relationship to carbon absorption, temperature rise, rate of combustion or reactivity, and to pressures.

That's why Semet-Solvay screens its five standard sizes of coke so carefully. And *after* screening, it is actually *hand-picked* to eliminate any oversized or off-quality pieces which might affect results in your cupola.

Yes, there's a size of Semet-Solvay coke just right for your foundry—it's uniform in size and quality for uniform results.

For the whole story, write Dept. 612-F today for our brand-new booklet, "The Advantages of Using Semet-Solvay Foundry Coke."

SEMET-SOLVAY DIVISION
40 Rector Street, New York 6, N.Y.

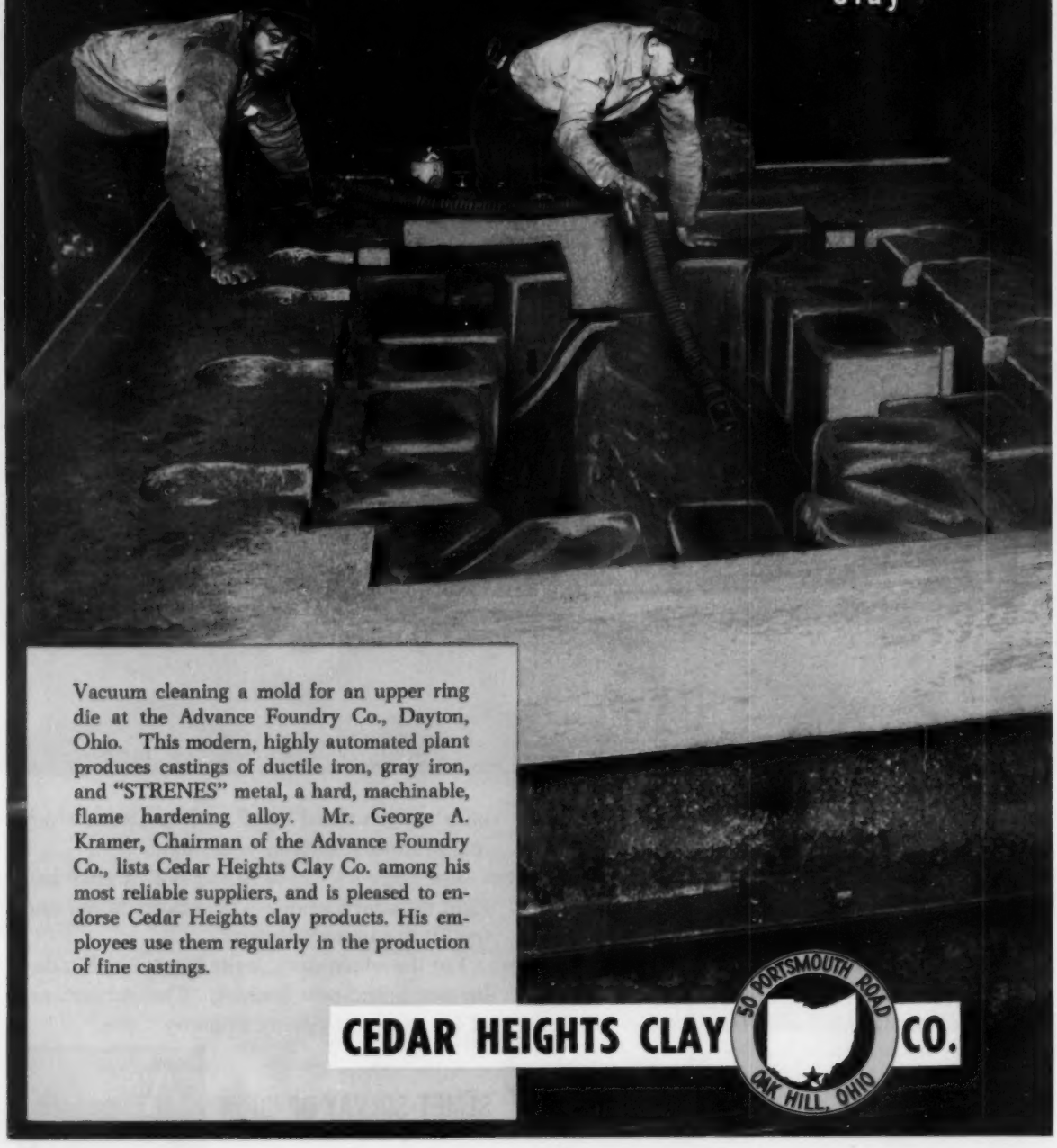
Allied Chemical
BASIC TO AMERICA'S PROGRESS

For More Information Circle 602, Page 39

Cedar Heights
Air Floated Clay

Cedar Heights Fire Clay

Cedar
Heights
Bonding
Clay



Vacuum cleaning a mold for an upper ring die at the Advance Foundry Co., Dayton, Ohio. This modern, highly automated plant produces castings of ductile iron, gray iron, and "STRENES" metal, a hard, machinable, flame hardening alloy. Mr. George A. Kramer, Chairman of the Advance Foundry Co., lists Cedar Heights Clay Co. among his most reliable suppliers, and is pleased to endorse Cedar Heights clay products. His employees use them regularly in the production of fine castings.

CEDAR HEIGHTS CLAY CO.

50 PORTSMOUTH ROAD
OAK HILL, OHIO

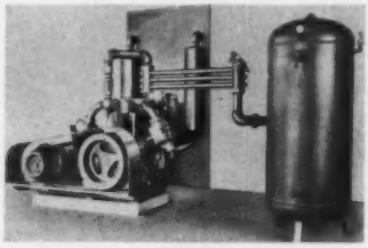
Units are available from 2 hp up with air or spring tensioning. Belts range from 2 through 6 in. wide and from 72 through 132 in. long.—**Grinding & Polishing Machinery Corp.**, 2530 Winthrop Ave., Indianapolis 5, Ind.

For More Details Circle No. 464—Page 39

COMPRESSOR ACCESSORIES

Company is offering line of accessories for its S2 stationary air compressor. Accessories can be installed either at the factory or by the customer and include a control system to meet demands by start-stop operation, starting delay system, oil filter, drive belt guard, and an intercooler guard.

Other accessories, to be installed by the customer, include watercooled



aftercoolers, low oil pressure safety switch, intake air silencers, air receivers, pressure gages, safety valves, and brass receiver drain valves. Also available are line starters and time delay relay switches which are furnished complete with wiring diagrams for customer installation.—**Le Roi Div., Westinghouse Air Brake Co.**, Sidney, Ohio.

For More Details Circle No. 465—Page 39

SANDBLASTING GRIT

Black Beauty sandblasting grit is said to produce a minimum quantity of dust and to be devoid of silicosis health hazard. It requires no special equipment, can be reused, and is impervious to moisture. Grit is available in many grain sizes. Company is offering a free sample kit so that proper grain size can be selected.—**H. B. Reed & Co.**, 6937 Kennedy Ave., Hammond, Ind.

For More Details Circle No. 466—Page 39

SAFETY HATS

Safety hats now incorporate a new suspension assembly claimed to be stronger, lighter, and more comfortable. A sweatband, sizing band, and supporting crown make up the

assembly. It is fabricated from polyethylene fortified against cracking under prolonged ultraviolet exposure, and all fittings are polyethylene snap type. Fiberglass hats are offered in eight colors and anodized aluminum models in five colors, all with the suspension assembly.—**Boyer-Campbell Co.**, 801 W. Baltimore, Detroit 2, Mich.

For More Details Circle No. 467—Page 39

CORE BINDER

Unicore cereal binder is made by a new process which is claimed to allow savings of up to 20 per cent in binder flour costs. The new process adds the solubles needed for firm core surface so that cores made with the binder are firm in the green state. Less time reportedly is spent in manual touchup of cores, and addition of extra soluble materials can be reduced or eliminated. Other features include improved resistance to sagging, smoother castings, and controlled product density.—**General Foods Corp.**, Corn Mill Operation, Kankakee, Ill.

For More Details Circle No. 468—Page 39

AIR PRESSURE REGULATORS

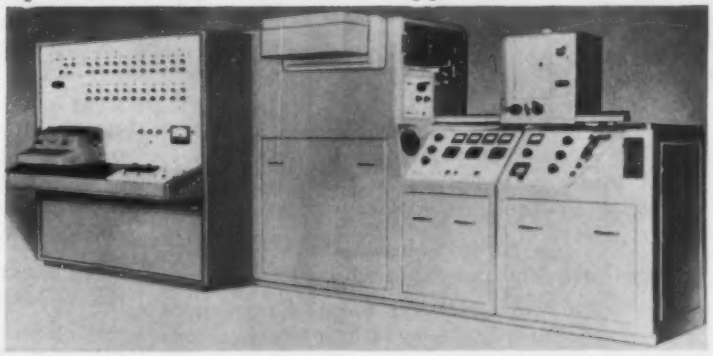
Crown pilot-controlled air pressure regulators make possible remote regulation of inaccessible air lines. An air column applies constant force on the diaphragm, and is governed by a pilot regulator operating at practically "no-flow." Any size of regulator with the desired pressure range can be used as the pilot and can be mounted in any convenient location.—**Hannifin Co.**, Dept. 238, 501 S. Wolf Rd., Des Plaines, Ill.

For More Details Circle No. 469—Page 39

SAFETY GLASSES

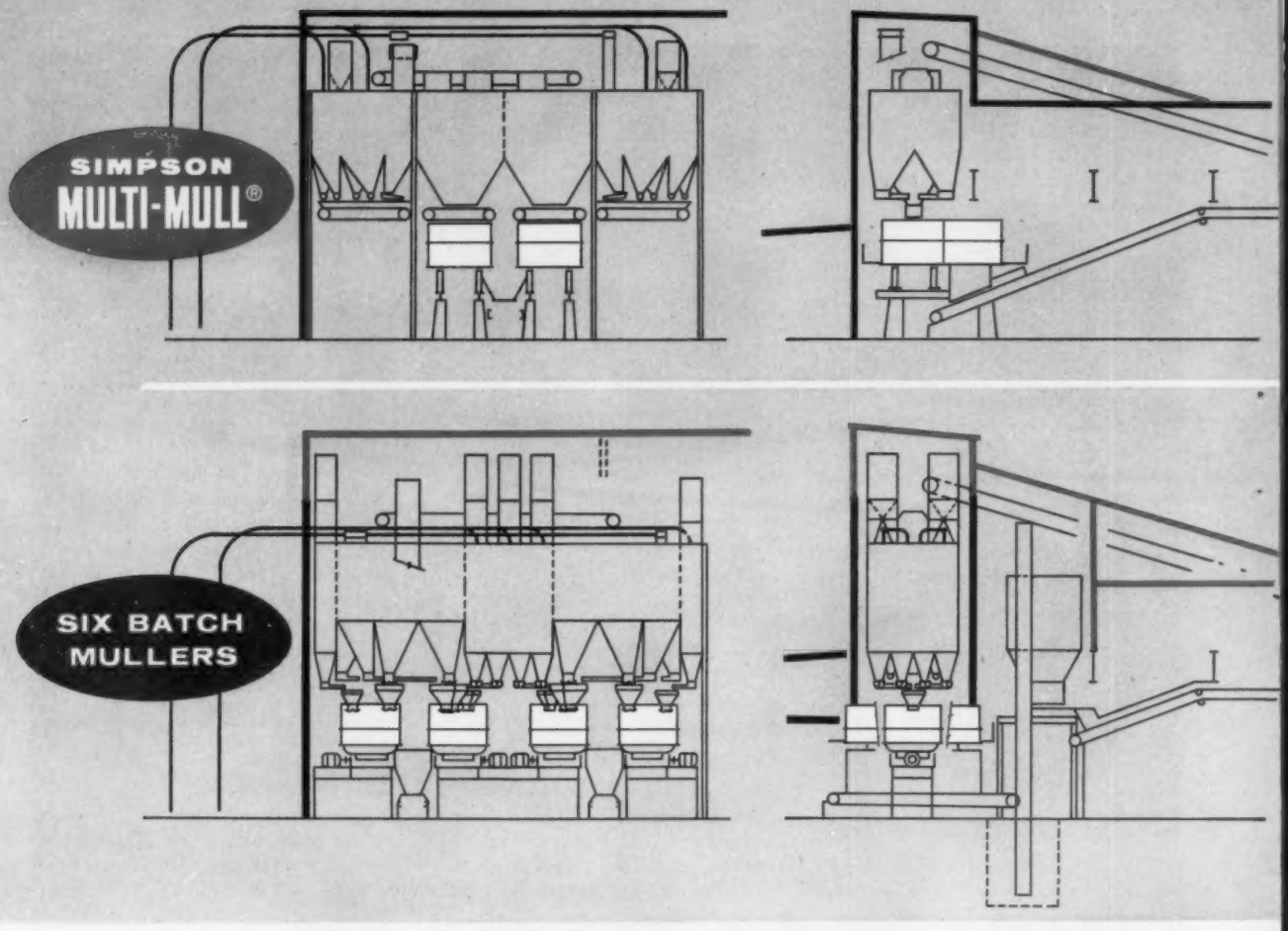
Safety glasses feature one-size bridge construction which is thicker for additional strength. Lenses are 46 and 48 mm and will fit most bridge sizes and shapes so that

Spectrometer Features Typewriter Readout



Direct - reading spectrometer features an electronic typewriter readout console, shown on the left in illustration. Spectrometric data are recorded automatically after the exposure has been terminated, and carbon copies can be made if desired. Preprinted or pretyped forms can be used to prepare complete analytical reports. The typewriter prints a number proportional to per cent concentration of the chemical elements present in the tested sample. The electronic typewriter readout console can be added to any of the company's direct-reading spectrometers by special arrangement.—**Jarrell-Ash Co.**, 26 Farwell St., Newtonville 60, Mass.

For More Details Circle No. 484—Page 39



BUT, WHAT DOES CONTINUOUS

Actual cost comparison shows 50% less in capital investment per ton/per hour of prepared sand capacity

Installations throughout the country now demonstrate that the continuous Simpson Multi-Mull turns out sand having physical properties superior to those produced in any batch muller—and in the massive tonnages required for automated molding.

But how do the equipment costs compare to those required for batch systems?

The drawings and specifications shown here detail, by cost and number, the equipment components needed for a continuous Multi-Mull system and those required for a six-muller batch system—to meet the customer specifications for an automatic molding line, as outlined at right.

Fewer components = 35% less cost

Cost analysis (see table) revealed that equipment requirements for the Multi-Mull system ran 35% less than those for the batch system. Cost of the mixers alone was $17,900 less than for the 6 high-RPM batch machines. Examination of the plans above will indicate that an even greater cost differential would have existed if building alterations necessary for the batch system had been included.

Needless to say, the Multi-Mull system was purchased for this plant.

An isolated case? No. This is but one of numerous Multi-Mull installations.

What does this mean to you?

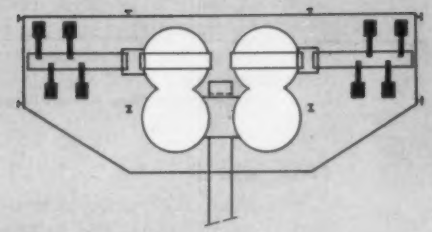
It means that a Multi-Mull sand preparing system will not only cost you less to operate and maintain—it will cost you less to purchase, less to install—and turn out more sand per dollar invested than any equipment you can buy.

... Foundrymen who are competitively waging the battle of profit vs. cost are meeting the challenge with Simpson Multi-Mull.

F381-G

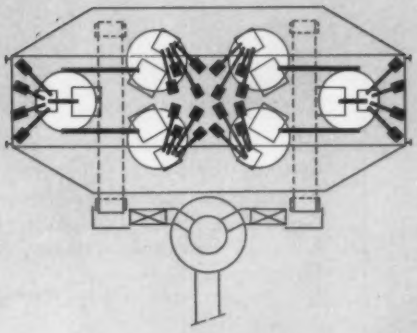
NATIONAL ENGINEERING COMPANY

646 Machinery Hall Building • Chicago 6, Illinois



BUILDING ADDITIONS

EXISTING BUILDING



MULLING COST?

CUSTOMER REQUIREMENTS:

Sand Preparing System for automatic molding

SAND PLANT	• minimum of 228 tons per hour grey iron system sand for instantaneous supply on demand from automatic molding machines. • 17 psi (max.) green compression strength. • plus or minus .2 percent moisture control.
ADDITIVES	• four additives plus new make-up sand. • water, sand and additives to be automatically metered to muller. • additives to be stored overhead in sufficient quantity to serve 16 hours of continuous operation without recharge of bins. • a dust-tight system for conveyance of additives and sand to bins from ground level storage.
SAND STORAGE	• sufficient to empty entire distribution system at end of second shift.
BUILDING ALTERATIONS	• pits and building changes are to be kept to a minimum.

Write for Multi-Mull Bulletin

For More Information Circle 604, Page 39

COMPARISON TABLE:

Sand Preparing Equipment Inventory

CONTINUOUS SYSTEM	BATCH SYSTEM
MIXERS*	
2-23F Simpson Multi-Mulls, 300 tons per hour capacity, dust hoods equipped with inlet chutes.	6-high-RPM batch mullers, 230 tons per hour capacity, dust hoods equipped to accommodate batch hoppers and bond weigh hoppers.
BINS	
2-for shakeout sand (60 tons ea.), 2 single tapered bottoms. 9-additive bins, 8 tapered bottoms. 2-new sand bins, 2 tapered bottoms.	2-for shakeout sand (60 tons ea.), 6 tapered bottoms. 17-additive bins, 24 tapered bottoms. 2-new sand bins, 6 tapered bottoms.
FEEDERS	
9-additive feeders, one size. 2-new sand feeders, one size. 2-sand feed belts. 2-additive feed belts.	24-addtiive feeders, in 3 sizes. 6-new sand feeders, in 2 sizes. 6-batch hoppers. 6-additive weigh hoppers with scales and controls.
AIR CONVEYOR	
1-new sand air conveyor line with diversion valve and end receiver. 2-additive air conveyor lines with 14 pneumatic valves.	1-new sand air conveyor line with diversion valve and end receiver. 2-additive air conveyor lines with 27 pneumatic valves.
DUST COLLECTOR	
4-additive bin collectors. 4-flop chutes.	9-additive bin collectors. 8-flop chutes.
MULLER CONTROL	
2-continuous moisture controllers. 9-sequence timers.	6-batch moisture controllers. 37-sequence timers and solenoids.
DISCHARGE	
1-prepared sand belt receiving hopper under discharge openings of 23Fs.	2-mill hoppers (each serve 3 mixers). 2-mill belts. 2-bucket elevators. 1-20 ton capacity prepared sand surge hopper with table feeder.
OTHER ELECTRICAL	
18-starters of various sizes. 4-110 volt feeds for new sand feeders and moisture control. 45-air conveyor controls.	44-starters of various sizes. 12-110 volt feeds for moisture and cycle control and sequence timers. 85-air conveyor controls.

RELATIVE COST

With 30% more sand capacity than specification requirements, the Simpson Multi-Mull system cost 35 % less than the high-RPM batch system.

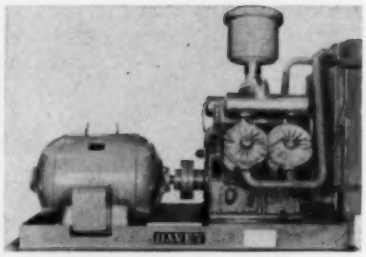
*Capacity of all mixing equipment included or considered in this specification was based on customer experience with mullers of both types now serving automatic molding lines in this foundry.

plant inventories can be reduced. Sideshields come perforated or unperforated, in flesh or green plastic, and plastic-bound, 20-mesh wire screen. Glasses are available in flesh or charcoal color with spatula or plastic-cable temples.—**Willson Products Div., Ray-O-Vac Co.**, Reading, Pa.

For More Details Circle No. 470—Page 39

AIR COMPRESSORS

New line of reciprocating air compressors consists of both single and two-stage units ranging from 7½ to 150-hp ratings. Both direct-



connected and V-belt drives are available. Single stage compressors are suitable for operation at 50 psi continuous pressure, two-stage at 125 psi. Unloaders are of suction valve type, which holds intake valves off seats when pressure reaches maximum setting. When pressure drops 10 psi, valves are released to operate from an adjustable pilot control valve. Automatic start-stop or dual controls also are available.—**Davey Compressor Co.**, Kent, Ohio.

For More Details Circle No. 471—Page 39

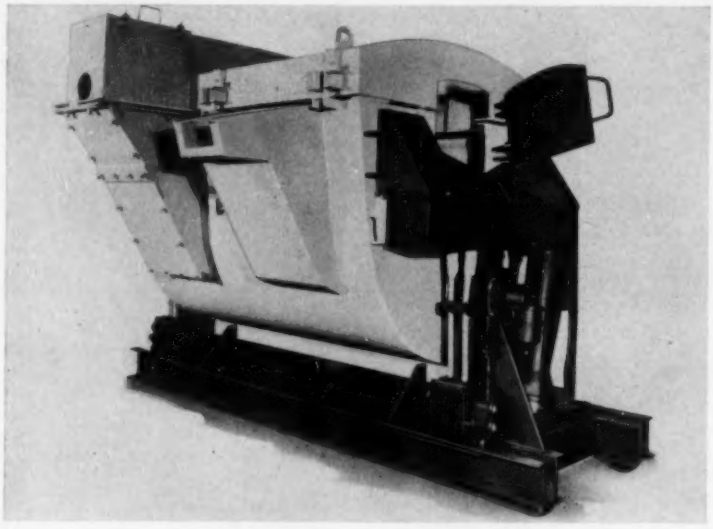
FACE SHIELD

Face shield is designed to be worn with a safety helmet and to protect the full face area including eyes and under-chin area. The shield fits all

safety helmets and is 16 x 9 in. with 0.040-in. thick visor. Other sizes can be made for special applications.—**General Scientific Equipment Co.**, Limekiln Pike and Williams Ave., Philadelphia 50, Pa.

For More Details Circle No. 472—Page 39

Induction Furnace Is for Melting, Holding



Low-frequency induction melting and receiving furnaces for ferrous and nonferrous metals feature controlled stirring action to avoid breaking the surface film which protects metal from oxidation.

Melting furnaces for iron are available in capacities up to 50 tons; other units are offered for steel, aluminum, copper, magnesium, brass, and bronze. Furnace line includes a crucible type, a twin-chamber type for melting and holding, melters and receivers with horizontal channels, and a coreless induction furnace with the heating coil on the outside of the bath.

Both ferrous and nonferrous furnaces can process borings, chips, and scrap, and losses in melting are claimed to be less than 1 per cent. Construction permits a furnace chamber to be exchanged for a spare when the refractory lining must be repaired. All furnaces have a power supply with nine-step tap changer for close temperature control. The uncorrected power factor varies between 0.8 and 0.6, and the coreless furnace power factor is 0.4 to 0.2.

Receiver and mixer units are offered in capacities up to 30 tons (a 4-ton unit is shown) and may be mounted on wheels.—**Hevi-Duty Electric Co.**, division of Basic Products Corp., Milwaukee 11, Wis.

For More Details Circle No. 485—Page 39

PATCHING REFRACTORY

Permanente 84, made to a new formulation, is to be used for rammed openhearth bottoms and for new bottoms of stainless steel electric furnaces as well as for hot patching material for basic steel furnace bottoms, banks, and tap holes. It is said to have high intermediate strength because of a new type of chemical bond which persists to higher temperatures.

Additional features of the material, which is made of periclase, include high magnesia content, high refractoriness, low shrinkage, and uniformity of size and properties. Also, it gives a high rammed density of up to 170 lb per cu ft and has high resistance to slag and metal attack.—**Kaiser Refractories & Chemicals Div., Kaiser Aluminum & Chemical Corp.**, Kaiser Center, 300 Lakeside Dr., Oakland 12, Calif.

For More Details Circle No. 473—Page 39

HIGH-HARDNESS ABRASIVE

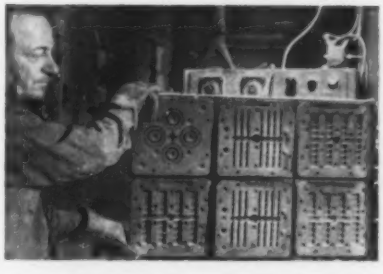
Improved high-hardness pearlitic malleable abrasive is said to give 15 per cent faster cleaning action. A new heat process reduces graphitic

CRUCIBLE STEEL SAVES THIS MUCH RESIN PER 250-LB. DRUM

...by using high-quality MC shell-molding sand.

The unique physical characteristics and screen distribution of Pennsylvania Glass Sand's MC shell-molding sand enable Crucible Steel Company of America to reduce resin content by 25% and produce higher quality castings with better finish. This superior shell-molding sand comes from the PGS deposit at Mill Creek, Oklahoma—nearly 1,500 miles from Crucible's Harrison, N. J., plant. Nevertheless, Crucible's resin savings more than offset shipping costs from Oklahoma, while MC sand helps them produce castings of top-market quality.

Supersil silica flour and 35 grades of foundry sands are available from PGS to meet any casting requirement. For full details, contact your nearest PGS office.



PENNSYLVANIA GLASS SAND CORPORATION

INDUSTRIAL SILICA DIVISION — PIONEER SILICA PRODUCTS CO.

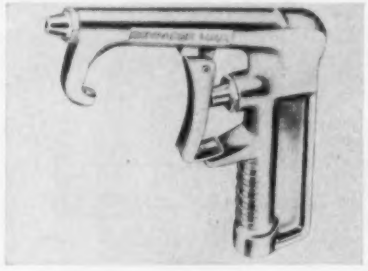
Sales offices in New York, Pittsburgh, St. Louis and Dallas · **Plants** in Newport, N. J. · Mapleton, Pa. · McVeytown, Pa. · Utica, Pa. · Berkeley Springs, W. Va. · Dundee, Ohio · Geauga Lake, Ohio · Phalanx, Ohio · Klondike, Mo. · Pacific, Mo. · Mill Creek, Okla. · Brady, Texas.

carbon levels to less than 0.03 per cent of the total content, without increasing blast machine wear or cutting abrasive life. — **National Metal Abrasive Co.**, 3560 Norton Ave., Cleveland 11, Ohio.

For More Details Circle No. 474—Page 39

BLOW GUN

Pistol grip blow gun is made of aluminum and weighs only 6½ oz. Features include nonslip pistol grip,



nonpinch trigger action, and a large hangup hook. Poppet-action valve utilizes O-ring construction, and the standard nozzle interchanges with other fittings or may be replaced with pipe extensions to direct air into hard to reach locations. Gun is supplied with a ¼-in. female NPT inlet which will accept standard air line couplings.—**A. Schrader's Son**, division of Scovill Mfg. Co., 470 Vanderbilt Ave., Brooklyn, N. Y.

For More Details Circle No. 475—Page 39

EAR PLUGS

Ear plugs to control noise entering the ears are offered in soft polyvinylchloride and firmer modified polystyrene. Both materials shut out shock noises, but permit the wearer to hear normal conversations. Plugs are easily cleansed with ordinary soap and water. They are offered in two sizes, small-medium and medium-large, and are designed so they do not enter the ear canal, where they might cause irritation. — **M-M-A Inc.**, Lancaster, Pa.

For More Details Circle No. 476—Page 39

MATERIAL CONDITIONER

Conditioner is said to permit dust-free handling of powdery, finely divided material in bulk quantities. Material drops onto a distributing cone and forms a thin-walled curtain of falling material between ¼ and ⅜ in. thick. A spray jet under the cone applies a solution of water and a surface-active compound called Compound MR. A small amount of moisture added in this manner serves to render the material dust-free. Internal scraper blades keep the sides of the unit clean at all times. Treated material drops onto a retention plate at the base of the unit where a rotary table feeder discharges continuously to fit the flow of the subsequent materials handling system.—**Johnson-March Corp.**, Philadelphia, Pa.

For More Details Circle No. 477—Page 39

DUST PRECIPITATOR

Electrostatic precipitator is custom built to suit the job, utilizing modular construction techniques. A flat collector plate design is said to provide high collection efficiency and the following additional advantages: 1. Clean plate sparking voltage is improved. 2. Migration velocity of dust particles to the collecting electrode is increased. 3. Better performance is achieved with high resistivity dust. 4. There is

less turbulence. 5. Rapping is easier, by either pneumatic or electric means.

High voltage rectifiers available include silicon, selenium, vacuum tube, and mechanical types. Control options, which can be automated, are saturable reactor, monocyclic network, and resistor types.—**American-Standard Industrial Div.**, Detroit 32, Mich.

For More Details Circle No. 478—Page 39

CUTOFF WHEEL

Cutoff wheel features cutting action on both sides as well as on the face of the wheel. Three-sided abrasive action is said to reduce heat-producing friction because it grinds its own clearance. Consequently, a faster cut with less burn and burr is claimed. Reduction of heat also reduces wheel wear and permits use of a harder wheel. Resinoid bond is used for the wheel.—**American Emery Wheel Works**, 1 Richmond Square, Providence, R. I.

For More Details Circle No. 479—Page 39

RECORDER CONTROLLER

Model 30D recorder and controller automatically records and controls dewpoint of protective gas atmospheres used in such applications as heat treating and brazing. Sensing unit in this instrument is a relative - humidity device which eliminates condensation and evaporation of water vapor and its extraneous contaminants of the gas sample, eliminates need for a refrigeration unit, and requires only a water line when the instrument is operating over its usual range of −10 to +70° F dewpoint. Unit is said to require less maintenance than similar systems.—**Barber-Colman Co.**, Rockford, Ill.

For More Details Circle No. 480—Page 39

FINISHING COMPOUNDS

Three barrel finishing compounds are for burnishing, cleaning, and cut-down applications. Compound No. 101 is a highly concentrated powder for the burnishing of aluminum, zinc, stainless steel and other metals. No. 101A is a liquid for metal cleaning, burnishing, and light degreasing operations, and is recommended for use in spindle machines, submerged barrels, and vibratory finishing machines. No. 403 is a closely screened, aluminum-oxide base compound for cut-down of both ferrous and nonferrous metals. It contains grease and oil emulsifiers, water softeners, rust inhibitors, and abrasive materials. — **Almco, Queen Products Div., King-Seeley Corp.**, Albert Lea, Minn.

For More Details Circle No. 481—Page 39

SAND COATING RESIN

Resin-hardener combination is available to produce both hot and warm coated sand for shell molds and cores. The resin, Bakelite phenolic resin BRL-5009, is not inflammable because water is used as the

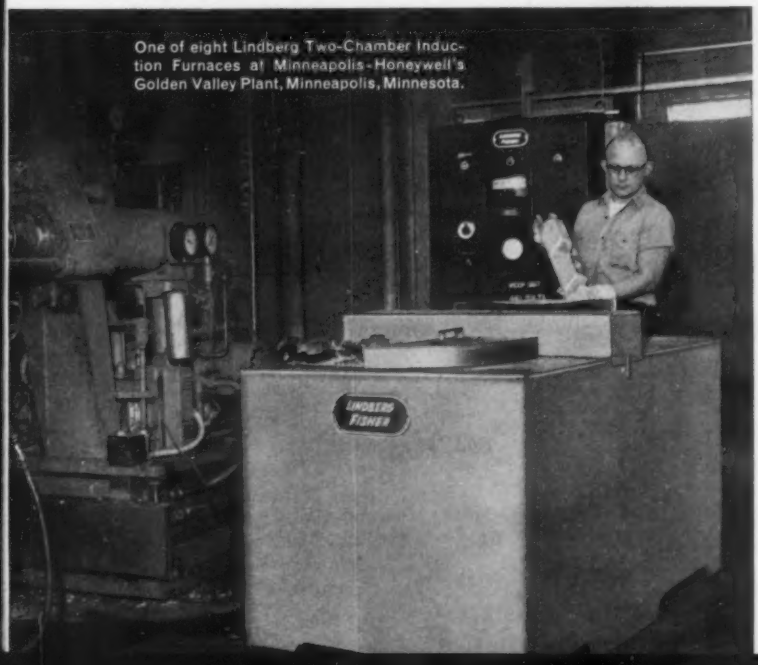
ART GEORGE has a good word to say for Lindberg Melting Furnace performance

QUOTE

Mr. Art George, Senior Production Engineer, Golden Valley Plant, Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

"Our installation of eight* Lindberg-Fisher Two-Chamber Induction Melting and Holding Furnaces has given remarkable service for more than four years. In this period, with the help of a well executed Honeywell maintenance program, the installation has been unusually trouble-free. Only one of the eight furnaces has required relining over this long period. Handling more than 1,000,000 pounds of aluminum and zinc annually, the installation has unfailingly provided the consistently high quality of metal our precision instruments require."

**Altogether, 44 Lindberg Furnaces are in operation in various Honeywell plants.*



One of eight Lindberg Two-Chamber Induction Furnaces at Minneapolis-Honeywell's Golden Valley Plant, Minneapolis, Minnesota.

These eight Lindberg-Fisher Induction Furnaces melt and hold aluminum and zinc for die casting gas valve housings and other component parts. They are located at the die casting machines where ingot and scrap can be melted and held at the desired casting temperature in one convenient unit. Magnetic fluxing and stirring insures uniform temperatures and consistently clean metal.

In any production process where aluminum needs heat there is Lindberg equipment to apply it most economically and efficiently. Furnaces for melting and holding, casting stations, re-melting or heat treating are available in all capacities, electric or fuel fired. Get in touch with your Lindberg Field Engineer (see your classified phone book) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2453 West Hubbard St., Chicago 12, Illinois.

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, South Africa, Spain, Switzerland and West Germany.

For More Information Circle 605, Page 39

LINDBERG
heat for industry

solvent. The phenolic hardener, BRP-0314, was developed especially for use with the new resin. Mix can be processed in sand mullers with hot air supply and also can be used with preheated sand. Fusion point of coated sand is 210° F, and the cold tensile strength of sand cured 2 min at 500° F is 380 psi. Hot tensile strength varies from 90 psi for sand cured for 60 sec at 400° F up to 280 psi for sand cured 135 sec at 400° F.

A remarkable degree of dimensional stability and tolerance control is claimed, and surface finish is said to be excellent.—**Union Carbide Plastics Co.**, division of Union Carbide Corp., 270 Park Ave., New York 17, N. Y.

For More Details Circle No. 486—Page 39

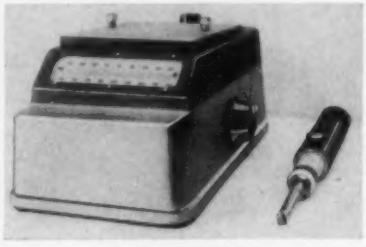
AIR HAMMER

Straight-handled air hammer is designed for close quarters, blind spots, and overhead suspension. Hammer weighs only 4¼ lb and measures 11¾ in. over-all, but is capable of heavy cutting, chipping, chiseling, or grooving. Operator has complete speed control and can lock any chisel used in six positions.—**Superior Pneumatic & Mfg. Inc.**, 13800 Enterprise Ave., Cleveland 35, Ohio.

For More Details Circle No. 487—Page 39

THERMOELECTRIC PROBE

Thermoelectric probe, Model TE-1, detects differences between metals, their alloys, and electrodeposited metallic coatings by means of their thermoelectric power. The test is fast, simple, and nondestructive. Metal bars or sheets which



look alike can be separated by contacting two points of the metal and noting the thermoelectric power.—**Electro Impulse Laboratory Inc.**, 208 River St., Red Bank, N. J.

For More Details Circle No. 488—Page 39

CHUTE LINER MATERIAL

Fabric-backed urethane is used as a liner to handle ore slurries, coal, coke, rock, sand and gravel, and other abrasive materials in chutes or hoppers. Fabric backing facilitates easy installation with conventional rubber-resin adhesives. It is available in standard stock sheet sizes from 12 x 20 in. to 96 x 40 in. in 1/16, ⅛, and ¼-in. gages.—**Armstrong Cork Co., Industrial Div.**, Lancaster, Pa.

For More Details Circle No. 489—Page 39

METAL ABRASIVE

Metal abrasive has increased austenite content for a ductile matrix. New material is said to break down more slowly than the original Controlled T abrasive, so that it continues to clean efficiently longer, resulting in reduced costs. It also extends the service life of blast machinery while improving production speeds. Rockwell C rating of the abrasive is between 50 and 60.—**National Metal Abrasive Co.**, 3560 Norton Ave., Cleveland 11, Ohio.

For More Details Circle No. 490—Page 39

USE NON-FLUID OIL IN AIR TOOLS TO INSURE TOP OPERATING POWER

Ordinary oil separates from water

NON-FLUID OIL
TRADE MARK REGISTERED

emulsifies with water

You can guarantee efficient operation of your air tools by being selective in your choice of lubricant. "NR" grades of NON-FLUID OIL are specifically designed to absorb destructive air-borne moisture into the lubricating film.

This prevents gumming and sticking which causes loss of speed and power. And when tools are out of service, the "NR" grades of NON-FLUID give complete protection because there isn't any moisture inside the tools to act as a free agent to start rusting and corrosion.

Don't take our word for this. Send for a free sample of "NR" and Bulletin 550 and make this simple test: Take an air tool which is back in Tool Crib because of lack of power. Fill the back-end of the tool with "NR," replace the air line and within a few seconds you will hear and feel the tool pick up speed and power. When "NR" is used regularly, tools remain at top speed and power and stay in service without chronic Tool Crib maintenance.

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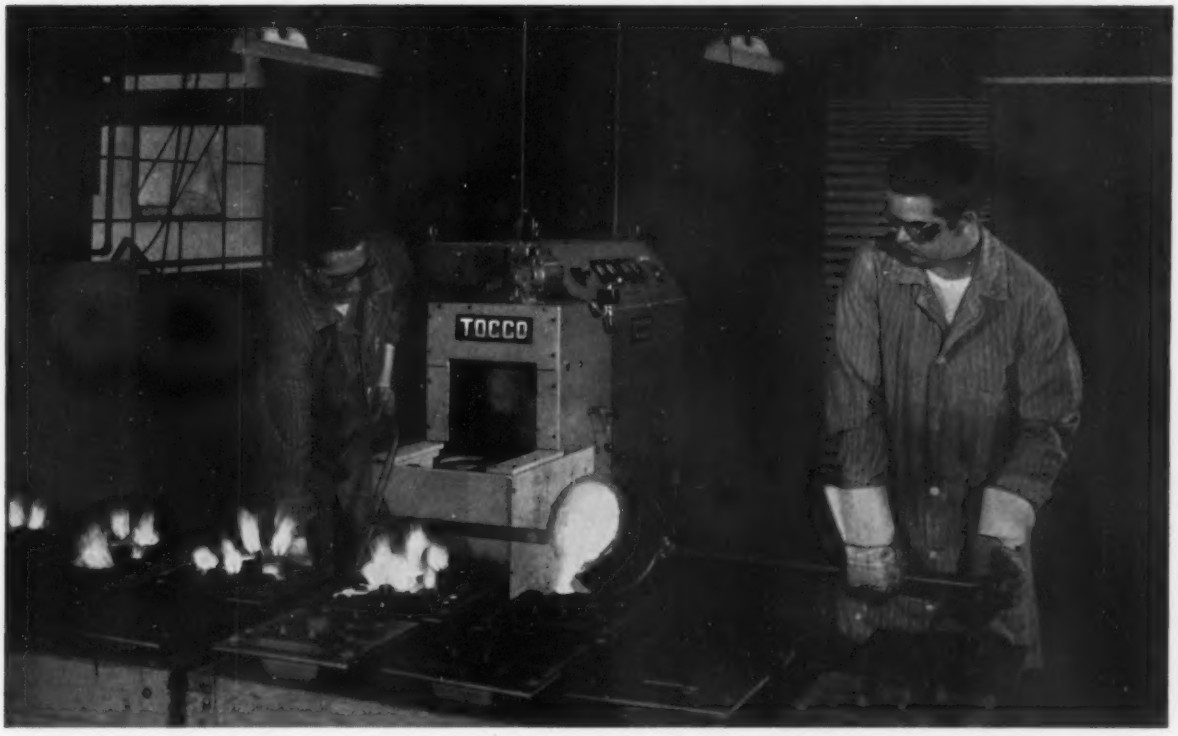
NON-FLUID OIL is not the name of a general class of lubricants but is a specific product of our manufacture. So-called grease imitations of a NON-FLUID oil often prove dangerous and costly.



TOCCO* Induction Heating

melts bronze, aluminum and stainless steel for high-precision, porous-free castings

Morse Instrument Company, Hudson, Ohio, manufacturer of marine hardware and control instruments, recently switched from conventional furnaces to TOCCO Induction Melting. Results: greater speed, better working conditions and, above all, purer, sounder castings.

"Castings are free from porosity since we switched to TOCCO Induction Melting," reports president John Morse. "This is a sales advantage to us and a tremendous quality advantage for our customers."

Whether you're interested in melting ferrous or nonferrous metals, TOCCO Induction Melting offers you these important advantages:

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- **Minimum Space Requirements**
- **No Special Installation Charge**
- **Simple, Safe Operation**
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If any of these advantages suggest economies in your operations, write for full details—no obligation, of course.

Sample castings produced by Morse Instrument Company with new shell molding process and TOCCO Induction Melting.

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Conference Program Features

F E F GRADUATES IN INDUSTRY

By ROBERT H. HERRMANN,
JACK C. MISKE and
WALLACE D. HUSKONEN

● THEME of the Foundry Educational Foundation's 14th annual College-Industry Conference at Hotel Statler-Hilton, Cleveland, April 19-20, was "The FEF Graduate in Industry." Most of the papers were presented by former FEF scholarship holders who have had a number of years' experience since graduation.

FEF President R. B. Parker, assistant to the president, American Brake Shoe Co., New York, presided at the annual business meeting which was part of the conference. In outlining FEF activities, he reported that student registration during the current school year totals 513. The division among departments is 236 metallurgical, 164 mechanical, 57 industrial, 18 electrical, and 38 in other departments.

The listing of 1961 FEF graduates available for employment totals 199; summer listings include 227 biographies. In addition, a number of students indicated that they had made employment commitments and asked that their names be withheld from the list.

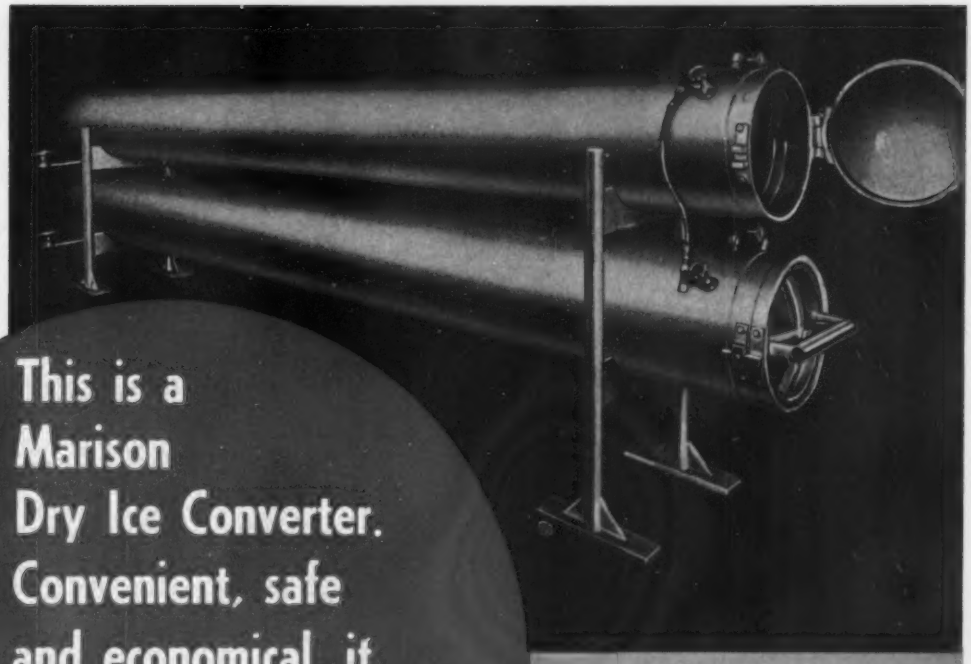
Companies participating in the annual employment opportunities survey listed 775 jobs available for graduates.

FEF scholarships awarded during the current school year numbered 150 for the first semester and 151 for the second. The Board of Awards selected four outstanding students for 1961 Wheelabrator Fellowships. They are Robert G. Chambers, Jonesboro, Ga.; David B. Routledge, Lexington, Ky.; William F. Stuhrke, Cleveland, and Thomas H. Steffen, Chicago.

During the year, FEF schools spent $310,150 of their own funds to develop better foundry facilities. This amounts to a dividend of about 350 per cent of funds invested in the FEF by industry. Two additional teachers were added to staffs to bring the number connected with cast metals to 85. Courses devoted to cast metals increased from 124 to 138.

Officers and Trustees — D. H. Morgan, director of college relations, Dow Chemical Co., Midland, Mich., was elected president for the coming year. C. F. Strom, vice president, Griffin Wheel Co., Chicago, is the new vice president. Anton Dorf-

Foundry Educational Foundation trustees and professors at a breakfast meeting



This is a Marison Dry Ice Converter. Convenient, safe and economical, it is saving money every day for foundrymen using the CO_2 process.

CO_2 liquid (for refilling cylinders) or CO_2 gas for blowing into cores or molds can be made instantly available in the Marison Dry Ice Converter where it is stored after conversion. These Converters are furnished in sizes ranging from twenty five pounds to one thousand pounds capacity. You simply load the dry ice into the Converters, lock them, and in about twelve hours you will be in business . . . . the CO_2 business, that is. Faster conversion (about one hour) may be accomplished by spraying hot water on the Converter. Marison equipment is made to conform to rigid safety regulations, American Society of Mechanical Engineers. Marison Dry Ice Converters don't require power, electricity or refrigeration. Worth investigating, aren't they?

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For More Information Circle 609, Page 39

mueller Jr., manager, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland, was re-elected secretary, and W. G. Gude, editor, FOUNDRY, was named treasurer. E. J. Walsh continues as executive director.

The following were chosen as trustees-at-large for three-year terms: E. H. Case, director of college and university relations, Deere & Co., Moline, Ill.; J. H. Culling, executive vice president, Carondelet Foundry Co., St. Louis; Lester B. Knight, president, Lester B. Knight & Associates, Chicago; J. L. Tillman, president, Unitcast Corp., Toledo, Ohio, and B. C. Yearley, vice president, National Malleable & Steel Castings Co., Cleveland.

R. J. Murphy, general foundry superintendent, LFM Mfg. Co. Div., Rockwell Mfg. Co., Atchison, Kans., was named director-at-large to fill the unexpired term of W. H. Muchnic, president of that firm.

Founding member society appointments of trustees for two-year terms are: American Foundrymen's Society—W. C. Jeffery, product development manager, McWane Cast Iron Pipe Co., Birmingham; Foundry Equipment Manufacturers Association—C. G. Hawley, general manager-sales, Jeffrey Mfg. Co., Columbus, Ohio; Gray Founders' Society—B. D. Claffey, general manager, GHR Foundry Div., Dayton Malleable Iron Co., Dayton, Ohio; Malleable Founders' Society—E. J. Stockum, vice president, Dayton Malleable Iron Co., Dayton, Ohio; Non-Ferrous Founders' Society—W. A. Gluntz, president, Gluntz Brass & Aluminum Foundry Co., Cleveland; Steel Founders' Society of America—M. J. Allen, vice president, American Steel Foundries, Chicago.

Speakers at the conference sessions were FEF graduates who told how they applied their education to their jobs in various fields of industry.

Metallurgy — Rudolph W. Zillmann, metallurgist, Pittsburgh Steel Foundry Co., a division of Textron Inc., Glassport, Pa. The transition from schooling to industry was characterized by a few experiences which this graduate did not fully anticipate. It was learned quickly that economics is the dominant motivating force behind every foundry operation.

Also, although schooling may be specialized for a metallurgist, job activities are not. This graduate became involved in sand practice, machining, heat treating, plant engineering, nondestructive testing, welding, pattern rigging, new molding and coremaking processes, quality control, and customer service.

The third main experience involved diplomacy. Knowing what to do and doing it are two different things. A novice should not take positive action without first learning the various facets of the operation as practiced by the old timers. Only by gaining their confidence first can one obtain cooperation in making changes.

Quality Control — Kenneth D. Carter, director of quality control, Forest City Foundries Co., Cleveland. The foundry industry, along with most other industries, is in a quality revolution. Customer demands are becoming increasingly more stringent.

The most important element in casting quality is uniformity, at a high quality level, of dimensions and of machinability. This has been brought about by the use of high-speed automatic equipment for machining castings.

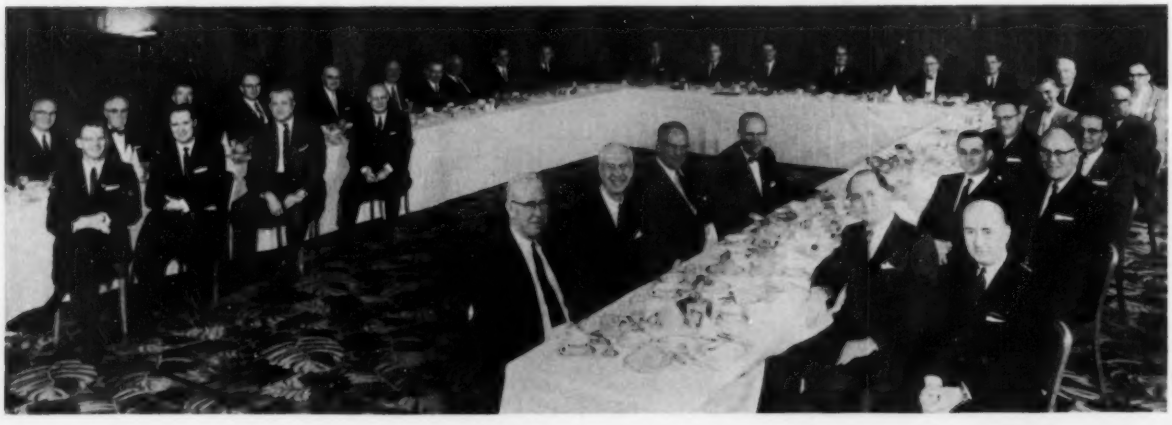
Trends in customer receiving inspection are to sample check only, rejecting the entire shipment if a defective casting is found. Other customers are machining castings without prior inspection. To do this they insist that satisfactory castings be shipped from the foundry.

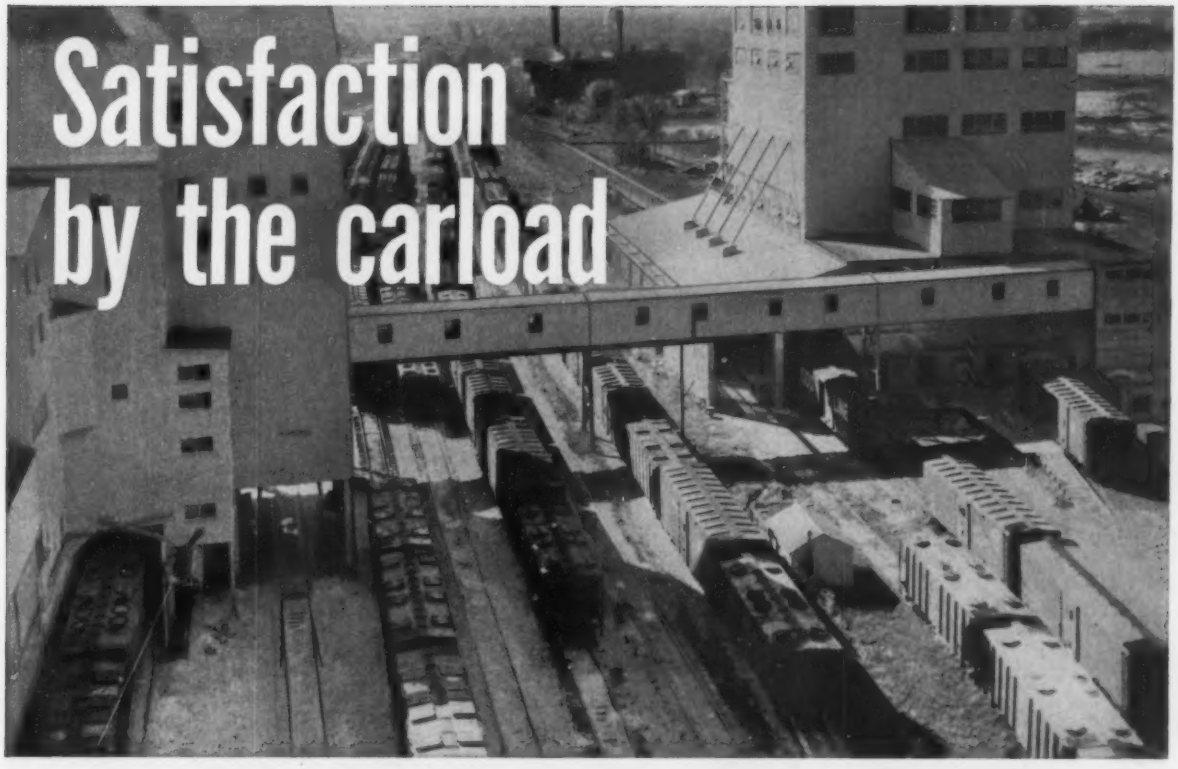
Castings inspection standards must be raised, tests must be rigid, and technically trained men should head and staff the quality control program.

Plant Engineering — John W. Wasem, plant engineer, Massillon Steel Casting Co., Massillon, Ohio. Plant engineering is the skillful and tactful management of the plant facilities for production in an economic manner. It involves the functions of safety, material handling, plant and/or departmental layout, methods improvement and wage incentives, equipment analysis, site selection, mechanization, plant construction, design and improvement of equipment, contract maintenance, spare parts control, maintenance control, and preventive maintenance.

Each of these functions was dis-

Foundry Educational Foundation alumni dinner preceded opening of the conference





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Foxboro Control Panel for 4-spindle pipe casting machine. Low-maintenance Dynalog* Electronic Indicator (center) shows deviation from set-weight while recorder (top) charts number of pours.

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custom-designed control systems help volume foundries increase production . . . produce more uniform castings . . . eliminate waste

Pipe, valve-bodies, parts — whenever you have a repetitive casting operation, a Foxboro Automatic Pouring Control System will help you do it more efficiently.

With this System you just set dials, and walk away. Instruments do the rest: weighing, pouring, sequencing — in short, making the whole pouring process automatic. Foxboro engineers will design your system, select the instrumentation, and custom-build the control panel to your requirements.

Ask your Foxboro Field Engineer for details on how Automatic Pouring Control can increase the efficiency of your foundry. Or write for complete information. The Foxboro Company, 326 Neponset Avenue, Foxboro, Massachusetts.

FOXBORO

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Over five years service in foundry sand...JOY Limberoller® idlers require no maintenance

At this large automotive foundry conventional steel idlers were a constant source of trouble. Spilled foundry sand would work its way into bearings and stop the idler rolls from turning. The result was torn conveyor belting and costly downtime.

After a trial installation, this foundry standardized on Joy Limberoller belt conveyor idlers throughout the plant. The frozen idler problem was completely eliminated, as well as the need for frequent inspection.

The Limberoller idler works so well because it has just two bearings instead of six. These are mounted at both ends of a flexible wire rope, to which neoprene discs are molded. The bearings are up out of the sand, unaffected by spillage. Fouled bearings are never a problem, and maintenance costs go down to almost nothing. Join the foundry men who have ended their sand conveyor problems by replacing steel idlers with Joy Limberollers. Conversion is quick and easy. We'll be glad to give you all the details . . . write for bulletin 2747-13.

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For More Information Circle 612, Page 39

cussed in detail, and programs of action were outlined.

Research and Development—Nicholas Sheptak, research and development engineer, Dow Metal Products Co., a division of Dow Chemical Co., Midland, Mich. Several projects on which this graduate worked were described to illustrate the application of technical training in research and development and to show challenges that are presented in the cast metals industry.

Projects described included studies of shell molding, solidification characteristics of magnesium alloys, centrifugal castings and mold coatings, vacuum apparatus for diecasting machines, and low-pressure casting. This graduate now is studying magnesium melting and transfer systems.

Design and Application, for a Foundry — Frederick J. Hodgson, chief production engineer, Eaton Mfg. Co., Vassar, Mich. Since the speaker's foundry makes gray iron castings in permanent molds and shell molds, design details such as section size, draft, and radiuses are very important. Design work includes casting drawings, mold drawings, corebox designs, and shell pattern equipment drawings produced from the customer's machine drawings.

Quotations are prepared after parting lines are set up, draft or radius changes suggested, and cores designed. All this information is provided to the customer with the quotation for evaluation. In all cases, there is close co-operation with the customer in every phase of design and production.

Design and Application, for a Customer—Bruce L. Harding, design engineer, Dynamac Inc., Matick, Mass. In his own work, the speaker specifies castings when he wants to minimize machining and assembly costs. Sometimes he has to specify weldments, usually because they are cheaper on short runs. Other designers are not so objective because they do not know the advantages and limitations of castings.

Designers must be educated to learn when to use castings. The foundry industry can do this by making sure that foundry courses are taught in schools and technical institutes, by organizing seminars

* A LITTLE NICKEL DOES A LOT FOR BRONZES

Adding up to 3% Nickel gives substantial improvement to Bronze Castings in the three major categories—bearing, pressure and structural types.

First, let's talk about Bearing Bronzes. Adding 1½% to 3% Nickel pays off in improved mechanical properties and lead dispersion.

In pressure castings, where 85% Copper, 5% Tin, 5% Lead and 5% Zinc alloys are used; or maybe 88% Copper, 10% Tin, and 2% Zinc; adding up to 2½% Nickel tends to refine the grain, which in turn increases pressure tightness. Strength and toughness in Navy "M" metals are increased when 1% Nickel is added.

In Aluminum Bronzes for the structural field, small additions of Nickel from 1% to 3% tend to increase the resistance to corrosion and the erosion action of sea water.

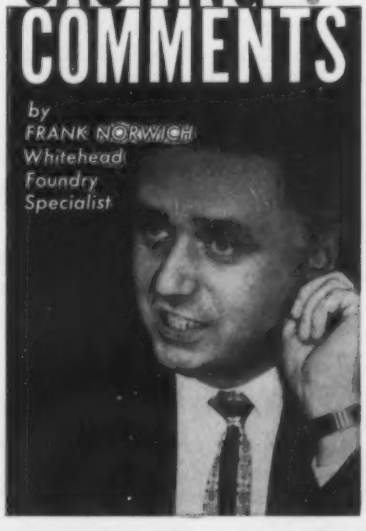
I'd like to chat with you some more about bronzes or any casting problem you may have. Give me a call.

Casting Comments by other Whitehead Foundry Specialists appear elsewhere in this issue. Look for them.

WHITEHEAD METALS, INC.
303 West 10th St., New York 14, N.Y.

CASTING * COMMENTS

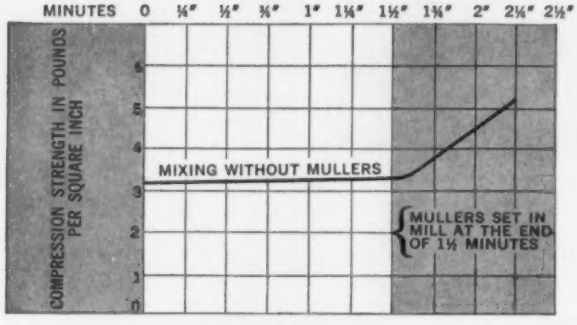
by
FRANK NORWICH
Whitehead
Foundry
Specialist



For More Information Circle 613, Page 39

Muller Mixing Increases Sand Strength Greatly . . . Rapidly!

Sand Strength Curve Proves the Difference



This Strength Curve Chart demonstrates how much more effective muller mixing of sand is over regular scraper type mixing. In this test a Clearfield mixer was used to mix a charge of 91% burned sand, 3% bond and 6% water. At the start of the run the mulling wheels were removed completely . . . the batch was charged and the mixing operation continued for 1½ minutes with only the disc and agitator operating on the material. *There was only a slight increase in the strength of the sand.* Then the mullers were set into the machine and operation on the same batch continued for 1¼ minutes. During this very short period with the mullers operating, *the sand strength increased very rapidly.* You can speed production, with assured quality results—and cut costs too—with a Clearfield muller-type mixer. *Let us prove the superiority of Clearfield Muller-type Mixers with a sample run of your own batch. Just call us.*

WITH its speed, dependability and special mixing features, a Clearfield Mixer prepares your sand properly and exactly as you want it . . . thus paying for itself many times over. In addition to the strength-building mullers, Clearfield Mixers have other features that assure quality results every time. First, all Clearfield Mixers work on the rotating pan principle so that every particle in the batch is kept in continuous motion, with the ingredients alternately spread and gathered together to maintain highest mixing efficiency.

Another feature is the patented star-shaped agitator which covers the entire flat surface of the revolving bottom and prevents material from forming hard cakes or lumps. The agitator is driven automatically by the force of the sand being rotated by the pan motion; a "whirlpool" action is created, speeding up the mixing process and promoting clean emptying of the pan.

The Clearfield double-duty disc, also patented, cuts all the material free from the revolving pan rim at each revolution, turns it over and diverts a continuous roll of material under the mullers. (Moved to the discharge position, this disc unloads the complete batch in 15 to 20 seconds!)

You get thorough, proper blending and mixing when you use a Clearfield Mixer.

for complete details about the wide variety of Clearfield Mixers, write for Catalog No. 90

CLEARFIELD MACHINE COMPANY
CLEARFIELD, PENNSYLVANIA, U.S.A.

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•

INGOT MOLDS

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Acme melting pots and ingot molds assure even heat distribution without hot spots . . . they improve non-ferrous casting quality and put a damper on rejects. Cast of a specially-developed iron alloy, Acme pots and molds provide great strength and unusual resistance to high temperatures, too. As a result they consistently reduce down time and substantially cut replacement costs.

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Quick delivery anywhere in the United States eliminates your "stand-by" non-ferrous pot and mold inventory. Write for bulletin listing all sizes and styles.

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FOUNDRY CO.

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Phone TA 5-2404

For More Information Circle 615, Page 39

for designers, and by providing plant visitations.

Technical Sales and Service, to Foundries—John W. Rendall, sales manager, Miller & Co., St. Louis. The trend is for technically trained men to move into technical sales and service activities. However, all engineering college students are not thoroughly acquainted with opportunities that exist in the field of technical sales and service, mainly because suppliers usually hire men who have experience in industry as well as a technical training.

After graduation, a new engineer works hard and learns quickly, so he is satisfied with his job. Later, however, his work no longer holds the exciting challenges for him and if new work and responsibilities are not forthcoming, he will look elsewhere. This type of man is the one that suppliers hire and use to good advantage.

Solving problems and responsibility make technical sales and service an interesting field. To do his job, an engineer in this field must work with his research and development departments, with his production department, and with the customer.

Technical Sales and Service, for Foundries—Ray H. Witt, president, Ray H. Witt Industries, Detroit. The selling of castings keeps the industry going. Salesmanship combined with technical knowledge makes a successful castings salesman.

Technically trained salesmen must spend much time with design personnel to insure that the customer knows the advantages of good castings, especially when a customer is a small company without the services of a metallurgical engineer. Even in larger companies the technical salesman may have to train the customer's engineers to use castings.

Before selling a casting, the technically trained castings salesman should determine if the casting can be redesigned to be lighter, stronger, simpler, and easier to cast. Also, he should check to see if the best alloy is being used.

Supervision and Management, Medium-Large Foundry—William J. Parana, chief metallurgist, Waukesha Foundry Co, Waukesha, Wis. The FEF graduate should expect to experience a training program, especially when he wants to get into

* LOW CARBON FERRO CHROMIUM FOR HIGH GRADE STAINLESS

Exlo Ferro Chromiums help you produce high quality stainless steels. They're true ferro alloys, and there's no danger of adding non-metallics which form crusty slags. Their high density is your assurance they will not float on the furnace slag to absorb nitrogen and possibly cause you to lose a heat with a low Nitrogen Spec.

Here are a few examples:

Exlo 75–75% min Cr, 0.015% max C and 0.75% max Si is best for very low carbon stainless steels.

Exlo .05 and .025 have a high chrome to carbon ratio, are exceptionally clean, and are perfect for low carbon stainless and heat resistant steels.

Most economical is our Intermediate Silicon Grade which analyzes 65-71% Cr, Carbon 0.03-0.05% and an Si range from 1-2%.

Need more information on these, or any of the more than 100 other alloys we handle? Let me know.

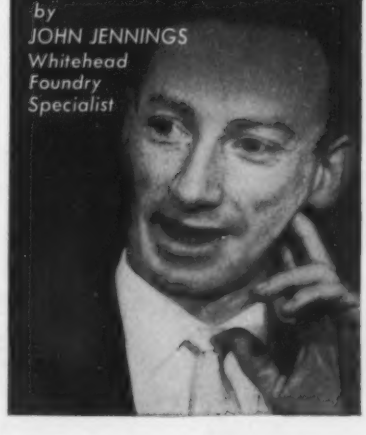
Casting Comments by other Whitehead Foundry Specialists appear elsewhere in this issue. Look for them.

WHITEHEAD METALS, INC.

303 West 10th St., New York 14, N.Y.

CASTING * COMMENTS

by
JOHN JENNINGS
Whitehead Foundry Specialist



For More Information Circle 616, Page 39

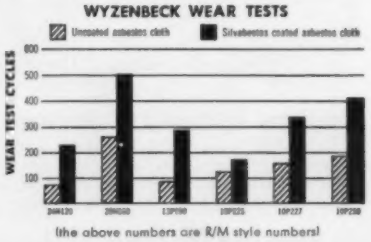
Silvabestos®—most rugged foundry gloves yet

Tired of paying for gloves that wear out too fast? Try a pair of flexible, lightweight gloves made of R/M Silvabestos® cloth—the amazing material that outwears regular asbestos cloth by as much as 249%.

Silvabestos gives you the kind of abrasion resistance you have always wanted. Retains its tensile strength even after repeated exposure to high heats. Cuts glove replacement costs.

Raybestos-Manhattan makes only the cloth—ask your regular safety garment supplier for genuine R/M Silvabestos gloves and other safety garments. Or write us for a list of manufacturers who fabricate Silvabestos.

Superior wear of Silvabestos (black bars) vs. uncoated asbestos cloths of the same grades is shown in test findings at right. *Note:* Silvabestos should not be used in contact with open flame.



(the above numbers are R/M style numbers)

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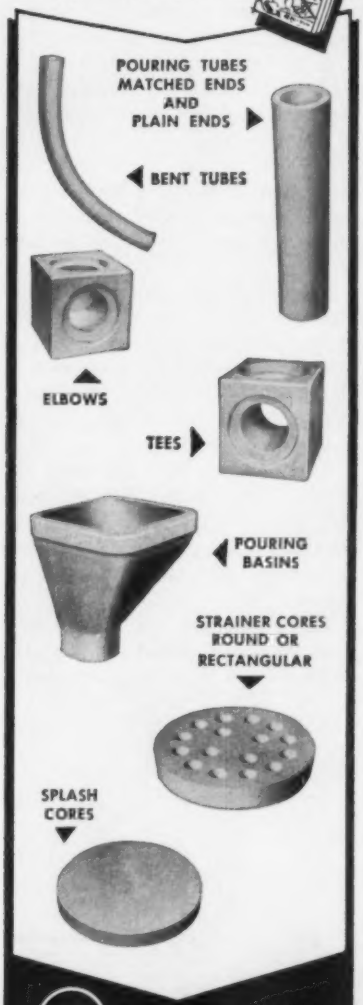

UNIVERSAL CLAY PRODUCTS CO.

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For More Information Circle 618, Page 39

management. He should learn the operations and responsibilities of each department. He will use his engineering background in all phases of production, but he will learn many things that are not in textbooks. The graduate will find that he can expect to be challenged daily by a different problem, yet he can enjoy some very satisfying work.

A school does not teach a student to do the job. Instead, it equips a student for continued self-education, especially for the engineer in supervision and management. The increasingly complex nature of the foundry industry requires that management for the future be taken from the ranks of technically trained foundry engineers.

Supervision and Management, Small Foundry — Jack Thompson, foundry engineer, Bodine Pattern & Foundry Co. St. Louis. The speaker works as foundry superintendent for a small sand foundry casting aluminum, brass, and bronze. In this job, he has helped in planning and laying out a new building in addition to his regular responsibilities for quality control, plant engineering, supervision of foremen, production control, personnel supervision, research and development, and preparing new jobs. He also helps with accounting, quoting, sales, and service.

From his engineering background, he obtained a technical vocabulary, developed an inquiring attitude, learned blueprint reading, developed the ability to plan and co-ordinate, and learned the science of metallurgy.

Education—Harry D. Bradshaw, assistant professor, Dept. of Metallurgical Engineering, University of Alabama. Teaching is interesting to the speaker because he likes to work with people. Financial return is not enough, but he is able to supplement it by contract research work and consulting. The speaker is in charge of teaching foundry courses, and the laboratory for this work includes a high-frequency induction furnace, an 18-in. cupola with hot blast, a 350-lb indirect arc furnace, and a gas-fired crucible furnace. All equipment, including a sand handling system, has been donated by industry.

One problem is finding employment for graduates in the foundry industry, either because foundries

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One thing you can be sure of — there are never any changes, never any variations in Alloy Briquettes. Whether they are Silicon, Manganese, Chromium or Silico-Manganese, the amount of alloy always remains the same.

Briquettes give closer control and add science to the old saying, "You only get out of a cupola what you put into it." The rub is that these days we can't always be sure of what is being put into the stack. The scrap used, pig, and steel all have variations and ranges in chemical composition, and the use of Briquettes assures the balance you require in your chemistry.

Silicon Briquettes come in two sizes, either 1 lb. or 2 lbs. of alloy contained. Chromium and Manganese Briquettes each contain 2 lbs. of alloy, and the Silico-Manganese contain ½ lb. Silicon and 2 lbs. Manganese.

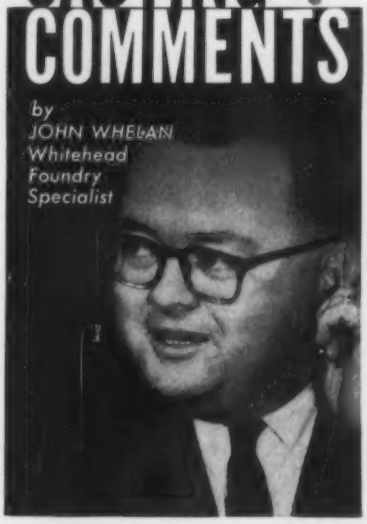
Incidentally, we distribute Vancoram Briquettes. So, if you would like to talk about their use in your shop, why not contact me?

Casting Comments by other Whitehead Foundry Specialists appear elsewhere in this issue. Look for them.

WHITEHEAD METALS, INC.
303 West 10th St., New York 14, N.Y.

CASTING * COMMENTS

by JOHN WHELAN Whitehead Foundry Specialist



For More Information Circle 619, Page 39

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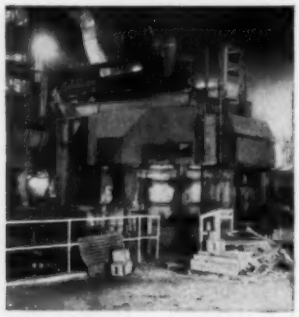
A demonstration of WHEELABRATOR'S

VITAL VALUES

In successfully ventilating 54 electric arc furnaces for 39 steel foundries, Wheelabrator has amassed a wealth of experience that promises an effective solution to your furnace fume problem. As a result, Wheelabrator can guarantee that discharged gases from the dust collector will be free of visible solids. Dustube furnace fume control systems do not restrict furnace operation and maintenance, do not affect metallurgy, minimize hood maintenance, permit easy furnace roof replacement, give maximum furnace roof life. Wheelabrator's vital experience in solving electric furnace problems is at your service. Write for complete information today.



This new 45-ton electric arc furnace, equipped with a Wheelabrator roof type furnace hood system, operates without escape of gas and fume even during melt-down and oxygen lancing cycles at a prominent eastern foundry.

VITAL VALUES FOR INDUSTRY

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do not know of the college placement bureaus or they do not realize they might be able to benefit from employing an engineer. As a result, the foundry industry loses good men to other industries.

Summer Employment—Company Viewpoint—John H. Culling, Carondelet Foundry Co., St. Louis. Growth of any business enterprise requires change and innovation. The foundry industry commonly uses consultants to provide this function, and to some extent student summer employees can be of value for the same purpose.

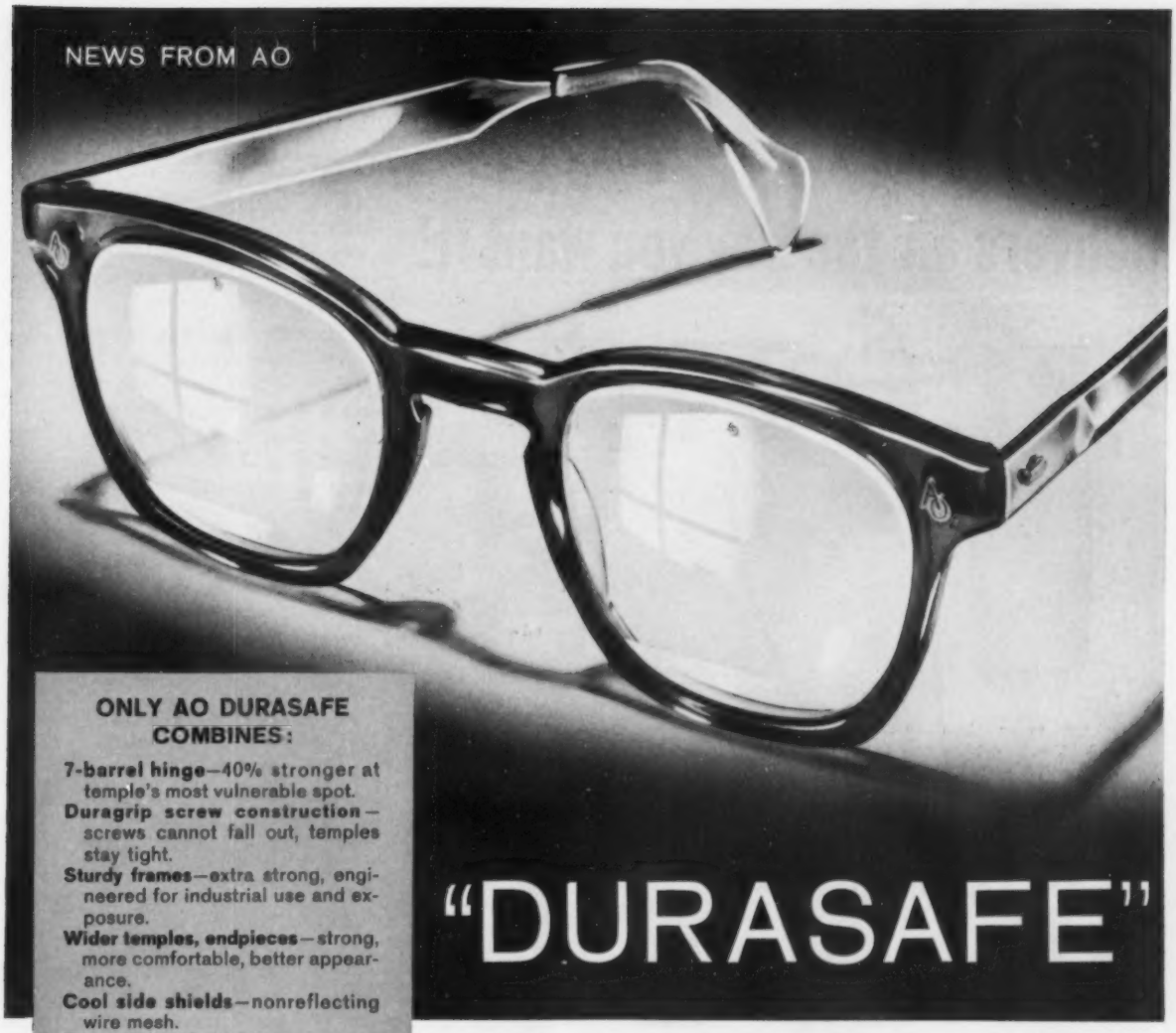
Every engineering student who works in a foundry eventually should be a source of aid to the industry, whether he finally works for the same company, a casting purchaser, or even a competitor. The student summer employee can perform in-plant experiments, testing, and improvement programs of an original nature. Short-term technical jobs are made to order for his talents. He should be given real assignments with projects of value, not made work or manual labor.

Summer Employment — Student Viewpoint—John W. Lodenkamper, student, Purdue University. Engineering students seek summer employment for a variety of reasons, including the following: 1. To earn money. 2. To gain experience. 3. To provide a basis for career decisions. Most students want summer jobs which will give them opportunity to use the technical knowledge they already have acquired.

The program at Carondelet Foundry Co. is based on planning and begins with a week of orienta-

"I know, boss, but with this flood, sand conditioning is a real problem right now"

NEWS FROM AO



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Easy to identify—AO monogram on frames and lenses identifies Durasafe at a glance.

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Your plant eye protection program's *full* effectiveness is governed by the workers' willingness to wear safety glasses (or goggles) regularly. In the new Durasafe, you have fitting qualities and a choice of colors and combinations that satisfy everyone . . . combined with the latest safety features that mean maximum protection and durability.

This wearer acceptance can be a big factor in preventing costly eye injuries. For the new Durasafe will protect against 80% of the eye hazards in an average industrial plant with a full eye protection program.* For full information on the glasses workers *want and will wear*, call your AO Safety Products Representative, or write for Bulletin S-1013.

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For More Information Circle 621, Page 39

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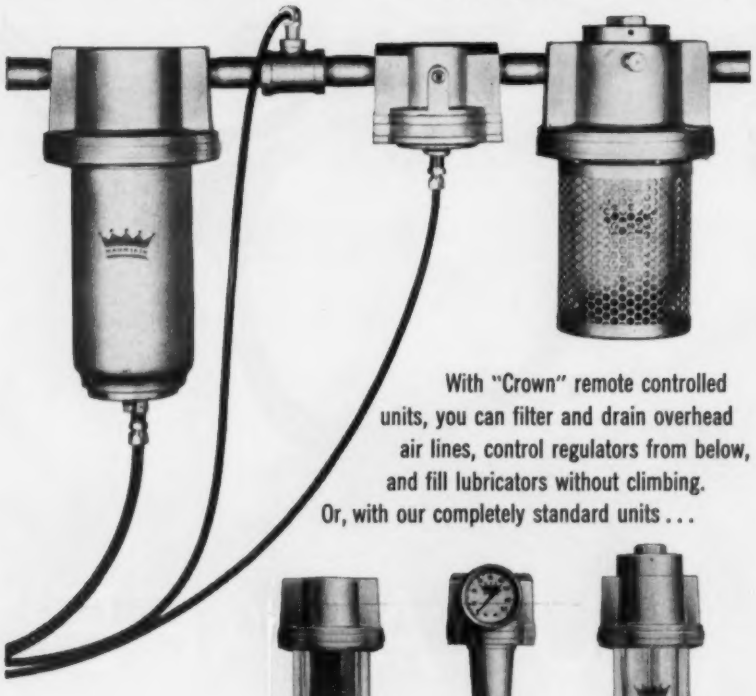
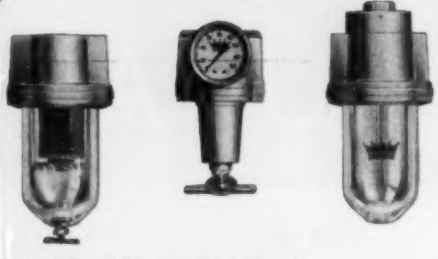


With "Crown" remote controlled units, you can filter and drain overhead air lines, control regulators from below, and fill lubricators without climbing. Or, with our completely standard units . . .



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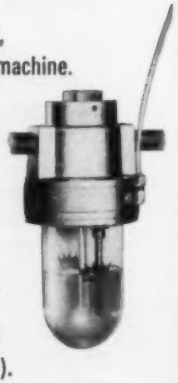
NEW! PULSE-LUBE . . . for off-beat air flow



If air flow is uphill or light or so infrequent that air-borne lubrication won't solve your problem, you can deliver oil just where you need it, in the exact amount you need, through a tiny flexible tube with new "Crown" Pulse-Lube . . .

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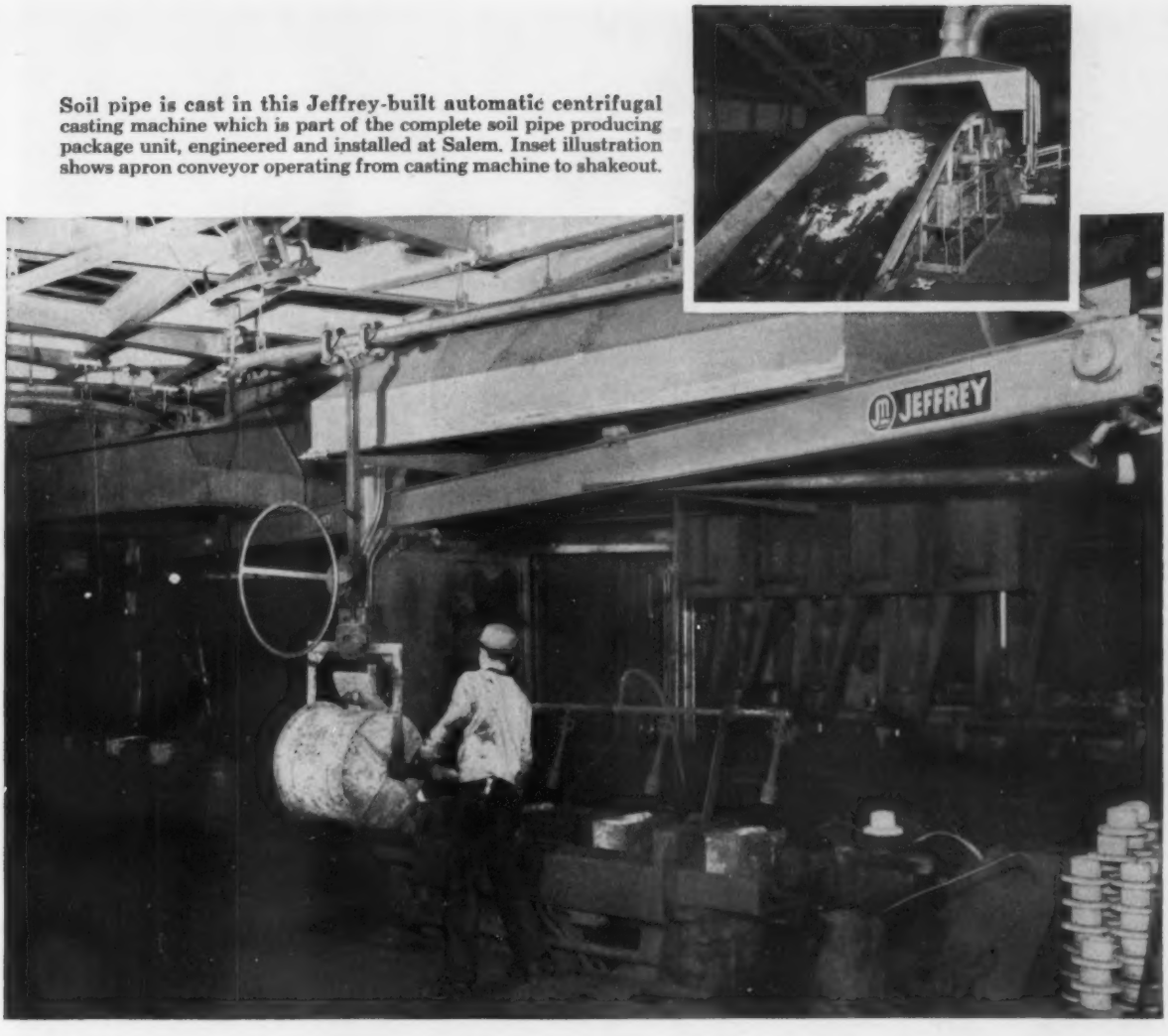
tion and project assignment. Progress reports on projects are submitted to management every two weeks, and weekly seminars are held to allow collective discussion of projects. Typical projects last year dealt with allocation of gas, air, water, and electricity costs to departments; planning of new laboratory facilities; testing and development of corrosion-resistant alloys; and similar problems.

Summer Employment—A Survey—Respondents to an FEF survey indicated that their chief reason for employing summer student workers is to improve the chances of hiring them after graduation. Other reasons, in approximate order of importance, included stimulation and motivation of students by direct foundry contact; handling of projects or problems not otherwise assigned to permanent personnel; providing financial aid to students; giving students an opportunity to apply theoretical concepts learned on the campus; and helping engineering education in general.

Most students are recruited for summer work as juniors or seniors or between those years. Final responsibility for administration of the summer student worker program usually is assigned to top management or operating personnel, but the personnel staff commonly is used. By a two-to-one ratio, students are assigned to one specific area or projects rather than put on a job rotation program. Compensation most commonly is "the going rate" for the job. In most instances—about 70 per cent of the time—foundries are successful in employing summer student workers after graduation.

The Engineering Undergraduate—Paul Repas, student, Case Institute of Technology. Case has two approaches to foundry training. One is for students who do not plan to enter the cast metals industries. Such students take a general course in types of fabrication. Those who plan to enter the cast metals field take courses which deal with specific aspects of foundry production and cover a wide variety of technical questions concerning the various cast metals.

At the time Mr. Repas was awarded an FEF scholarship, he had no idea of a career area and looked on the award primarily in



Soil pipe is cast in this Jeffrey-built automatic centrifugal casting machine which is part of the complete soil pipe producing package unit, engineered and installed at Salem. Inset illustration shows apron conveyor operating from casting machine to shakeout.

"Layout best...no better equipment," says Salem about Jeffrey turnkey job

The pictures on this page show a new, complete soil pipe producing unit engineered and installed by Jeffrey for Salem Pipe & Iron Manufacturing Company at its highly mechanized, modern soil pipe foundry in Bridgeton, New Jersey.

Here's what J. A. Lasater, General Manager, has to say about the job: "Our system we believe to be excellent. Our layout is probably the best in the industry. The equipment is typical of Jeffrey's high standards and we know of none better."

When it comes to service, here's what was said about the Jeffrey installation man on the job: "We consider it a privilege and a pleasure to work with him. We found him always helpful and cooperative ... fair and open-minded, but at the same time leaving little doubt he was a Jeffrey man."

Jeffrey equipment and engineering knowledge can help solve your problems, too. It will pay you in satisfaction and future profits to give your nearest Jeffrey office a call when you consider changes in your foundry. Or write The Jeffrey Manufacturing Company, 907 North Fourth St., Columbus 16, Ohio.

If it's conveyed, processed or mined, it's a job for Jeffrey. JEFFREY

For More Information Circle 623, Page 39

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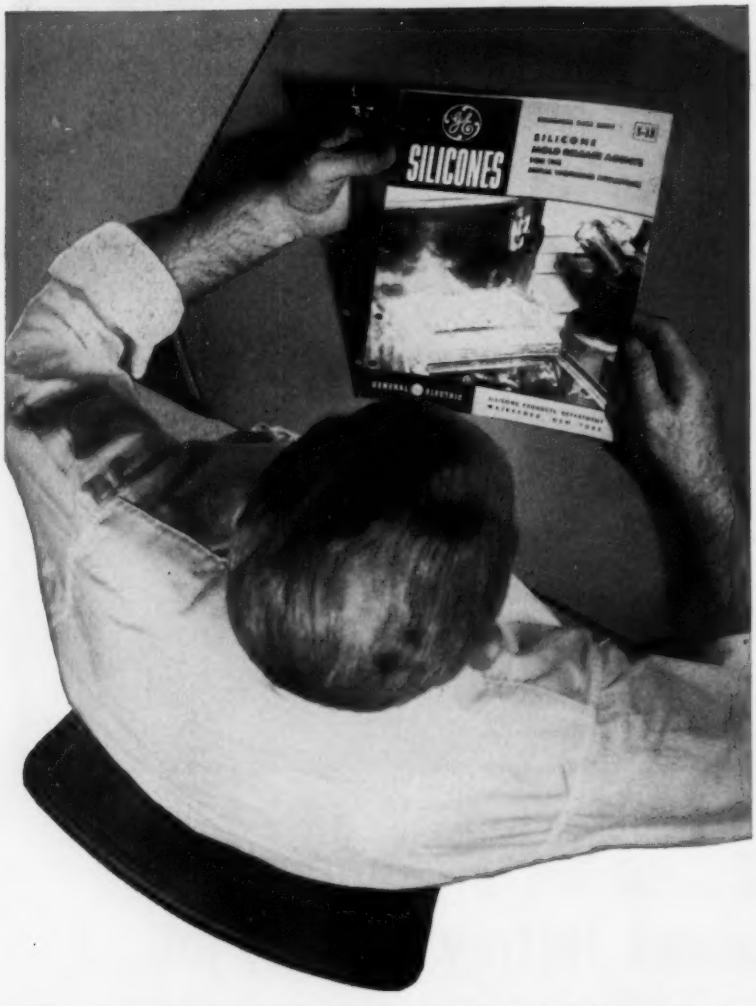

FREE, FACT-FILLED TECHNICAL DATA BOOK, offered by Frederic B. Stevens, Inc., gives you complete information on new, improved Stevens G.E. Silicone Release Agents for shell core, mold and hot box applications. Find out how you can benefit from these ideal G.E. silicone properties: rapid, even coverage . . . resistance to thermal breakdown . . . chemical inertness . . . maximum economy in application and in pattern cleaning.

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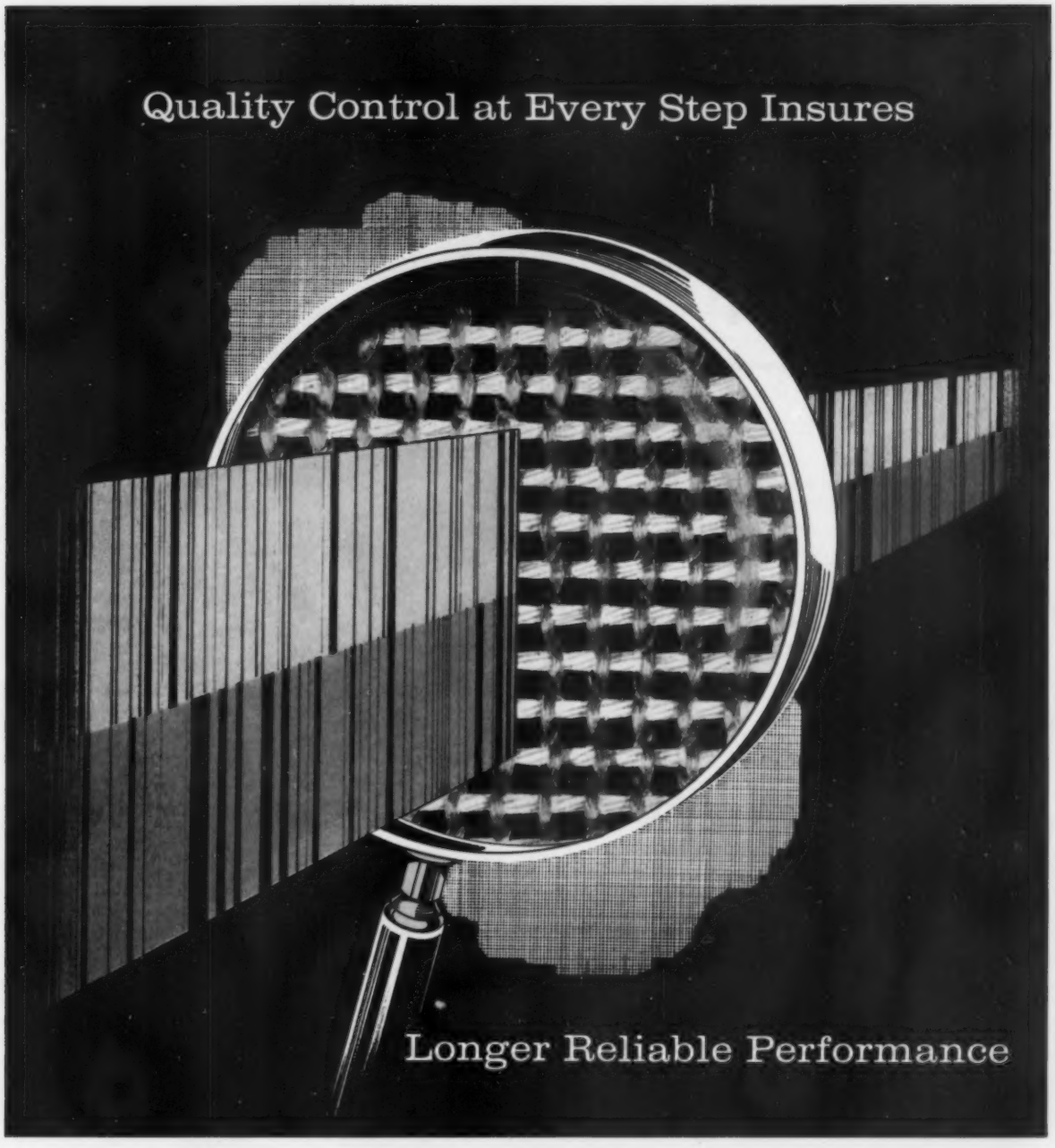
terms of financial help. Now, however, he has become aware of the nature and functions of cast metals and of the career opportunities the field offers because of its potentials as a source of engineering materials.

The Graduate Student in Cast Metals—Ernest J. Poirier, student, Massachusetts Institute of Technology. Mr. Poirier received his first exposure to cast metals as a co-operative student at Northeastern University, Boston, when he was given a job at the MIT foundry laboratory with Prof. Howard F. Taylor. Because Northeastern offers little metallurgical work, Mr. Poirier wished to get more to help him enter the foundry industry. On his graduation, he was awarded an FEF Wheelabrator Fellowship and later an American Brake Shoe Co. Scholarship to work on his master's degree.

He had no intention of going beyond that degree originally, but now is working for his doctor of philosophy degree. He was inspired to change his mind by an article on research by Prof. Taylor in FOUNDRY (March, 1961, p. 99), even though he does not want to enter research or teaching. He wants to work for a progressive company, attacking production problems from a scientific basis, providing a link between the practical and research and development efforts.

Blueprint for the FEF Future—Dr. David H. Morgan, Dow Chemical Co., and president, FEF. The FEF is the core of the foundry industry's educational effort. The industry has the potential for great growth as our population expands, but it can expect more competition from other processes, materials, countries, and from other curriculums in the universities. That competition will increase the need for more knowledge in cast metals and thereby for more brains to provide technical knowledge and ingenuity.

The role of the FEF in providing these brains is paramount, but the foundation requires more personal financial support which can be used to support the schools. The FEF program should be nearly twice as big as it is, and more money will make it possible for more schools, teachers, and students to become part of the program.



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The quality of any high purity metal can only be as good as the quality of the refractory cement used to contain it. That's why Norton is producing cement that is uniformly quality controlled — *in each separate phase of its processing* — both physically and chemically.

Norton Refractory linings give more heats and closely predictable performance from lot to lot. The optimum density of Norton Cements gives them the mechanical strength to withstand the highest operating temperatures without spalling, slumping or otherwise failing — and to resist stresses imposed during charging, pouring and cleaning.

Norton engineers are prepared to formulate refractory cement to satisfy your individual metallurgical requirements. You'll get greater economy with Norton Cements because they retain their effectiveness longer and eliminate much of the patching required by grades of lower quality. Take advantage of this new idea in quality-controlled, custom-formulated cements that can help produce a better end product for you. For details on ALUNDUM* aluminum oxide, MAGNORITE* magnesium oxide, spinels and CRYSTOLON* silicon carbide cements, write today to NORTON COMPANY, Refractories Division, 305 New Bond Street, Worcester 6, Mass.

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REFRACTORIES
Crystallizing ideas into products

For More Information Circle 625, Page 39

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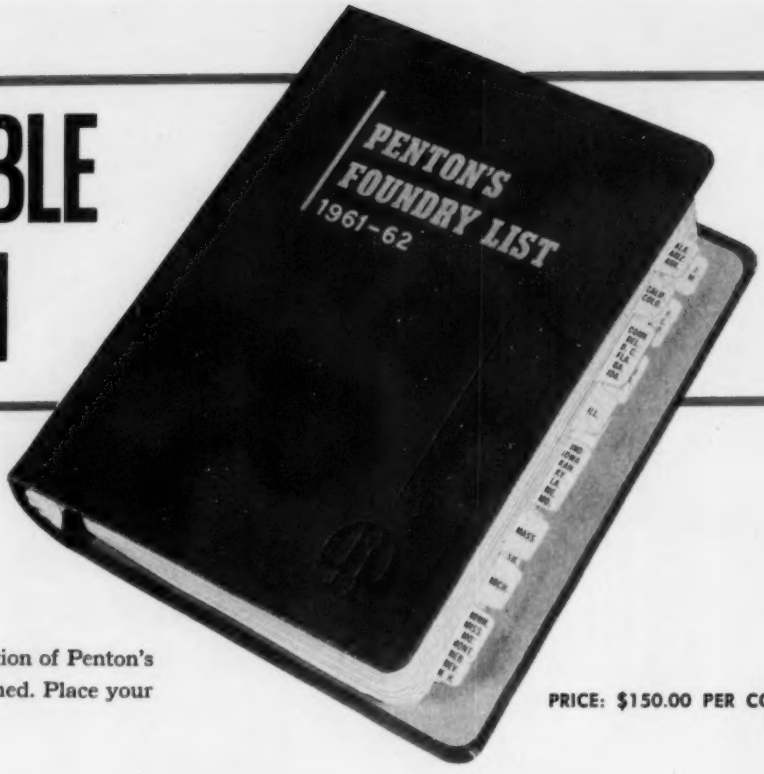


The new, up-to-date 1961-62 edition of Penton's Foundry List will soon be published. Place your order now for July delivery.

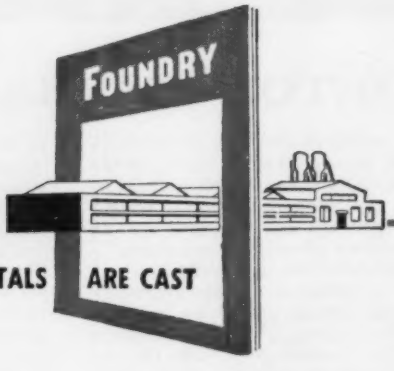
PRICE: $150.00 PER COPY.

PENTON'S FOUNDRY LIST and DIRECTORY

The new 1961-62 edition of PFL will soon be available (expected publication date, July 15). The new directory will give comprehensive information on all the 6,000 metal casting plants in the U. S. and Canada (including die casters). It will tell who they are and where they are located; what metals they cast, their melting equipment capacities, departments operated, etc.

Well-indexed, and in loose-leaf form, PFL is indispensable to casting buyers and foundry suppliers. Send your order to: Book Department, FOUNDRY, 1213 West Third St., Cleveland 13, Ohio.

ORDER NOW FOR JULY DELIVERY



Helping You Sell To Foundrymen

WHEREVER METALS

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INDUSTRY BRIEFS

Bendix Foundries, Bendix Corp., Teterboro, N. J., has completed negotiations to purchase land, buildings, and certain equipment previously rented from the Navy for production of aluminum and magnesium castings. Acquisition of the two buildings and 8½ acres of land gives the company a total of 175,168 sq ft of floor space for castings production.

Mountain States Steel Mfg. Co. has filed articles of incorporation to operate a general machine shop and foundry with main offices at 211 S. Dobson Rd., Mesa, Ariz. Incorporators include Irven Shuman, John C. Long, Ben Kindsvater, and R. L. McGregor.

Harry W. Dietert Co., Detroit, is completing an addition which will house research, development, engineering, and laboratory departments occupying 5000 sq ft.

Metallurgical Laboratories, San Francisco, has moved to 1142 Howard St., San Francisco, with Martin P. Quist, former chief chemist and director of Abbott A. Hanks Inc., joining the firm.

Kaiser Refractories & Chemicals Div. has completed a licensing agreement with Ceramica Olivos S.A., Buenos Aires, Argentina. Ceramica will manufacture and market a line of fire clay specialties under the Kaiser trademarks, formulas, and quality control methods.

Van Co. Inc., Colorado Springs, Colo., has filed articles of incorporation to operate a general foundry and machine shop, listing as incorporators and initial board of directors William T. and Evelyn E. Davis and Mervin A. Ziegler.

Case Institute of Technology, Cleveland, will name its new metallurgy building the Charles M. White Metallurgy Building, after Case trustee Charles M. White, former board chairman and chief executive officer, Republic Steel Corp., Cleveland. The new building has 71,450 sq ft of floor space and will be linked to the projected new Olin Center for Materials.

Armour Research Foundation, Illinois Institute of Technology, Chicago, recently celebrated its 25th year of scientific research for industry and government. The silver anniversary celebration will continue through May, 1962, and will include dedication of a new $3½ million chemistry research building and a $1.2 million mechanics research building extension.

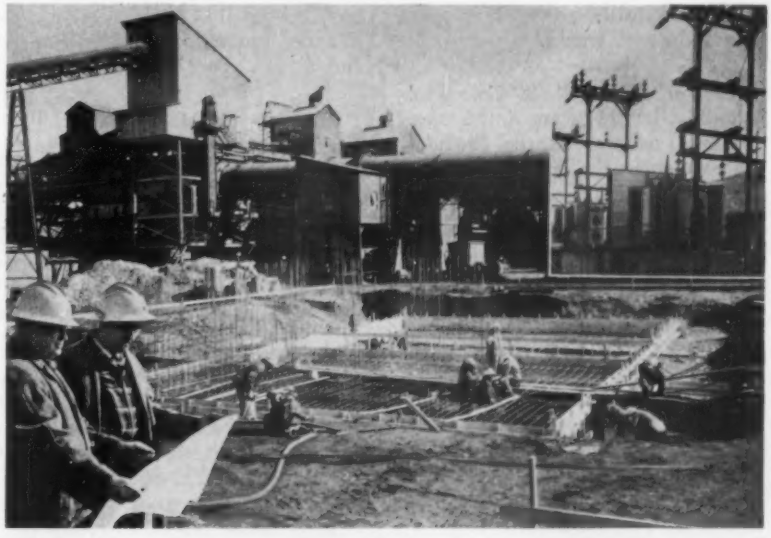
Columbus McKinnon Corp., Tonawanda, N. Y., has opened a manufacturing, sales, and service branch at 955 Indiana St., San Francisco. This branch will handle the company's Chisholm-Moore Hoist Div. hoists and Columbus McKinnon Chain Div. welded link chains. Arthur H. Luchs is regional manager.

Engineered Castings Div., American Brake Shoe Co., has sold its gray iron foundry at 1322 Main St., Melrose Park, Ill.

American Chain Div., American Chain & Cable Co., York, Pa., is operating assembly facilities for sling chains and other chain products at 2040 N. Hawthorne Ave., Melrose Park, Ill. The new factory also will handle servicing and reconditioning of sling chains already in use.

Michigan Oven Co., Detroit, has appointed Noble Equipment Co., LaGrange, Ohio, as Ohio sales representative, with C. E. Noble in charge.

Aro Equipment Corp., Bryan, Ohio, has changed its name to the Aro Corp. The name change was



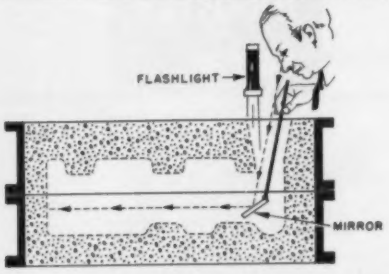
SPIEGELEISEN PLANT: New Jersey Zinc Co. has begun construction of a new electric furnace project at Palmerton, Pa., to produce the iron-manganese alloy, spiegeleisen. J. R. Connelly, manager of engineering, New Jersey Zinc Co., and H. H. Rahn, construction engineer, are shown discussing the plans of construction for the new project, which will replace the present blast furnace operation. Inset shows the substation area, which will be enlarged to meet increased power requirements. Project is scheduled to be completed in 1961

HOW TO DO IT

Useful Mold Inspection Device Is Made with Small Mirror

By MARION E. BAILEY
Quality Control Technician
Columbia Steel Casting Co.
Portland, Oreg.

DETECTING the presence of crushes or drop-outs in large molds before they are clamped and poured can save large castings from excessive repair or from the scrap pile. The interior of a mold can be examined easily with a simple device made with a small mirror.



Glue a small mirror on a piece of wood and secure the wood to a small diameter (about 3/16 in.) rod. By lowering the mirror through the riser opening into the mold cavity and using a flashlight to reflect light from the mirror to the interior of the mold and back to the eye, examination of the mold cavity is possible.

approved at the annual meeting of its shareholders, at which time Philip LeBoutillier Jr. was elected to the board of directors.

Towmotor Co., Cleveland, has completed preliminary plans with Lansing Bagnall Ltd. of England for the manufacture of gasoline, LP gas, and diesel-powered fork lift trucks and material carriers in England. Lansing Bagnall manufactures electrically powered fork lift and industrial trucks.

Carson, Marshall & Co., Philadelphia, has been appointed warehouse distributor in the Philadelphia area for the complete line of foundry supplies produced by Frederic B. Stevens Inc., Detroit.

Hardinge Mfg. Co., York, Pa., has appointed Sutherland's Foundry Service, P. O. Box 390, R. D. 3, Coatesville, Pa., to be its representative in central Pennsylvania, Maryland, District of Columbia, and portions of Virginia for the sale of castings, patterns, plate and structural steel work, and large custom machinery.

National Engineering Co., Chicago, has purchased Hydro-Blast Div., Guardite Co., a division of American Marietta Co., Wheeling, Ill. Hydro-Blast manufactures blast cleaning equipment and a wet system for reclaiming foundry sand.

American Chain & Cable Co., New York, has purchased Bancroft-Hickey Mfg. Co., Bristol, Pa. The new subsidiary will continue with present personnel to manufacture grinding wheels and other abrasive products.

S-P Mfg. Corp., Cleveland, has appointed TEC Engineering Corp., Logansport, Ind., to be its factory representative in Indiana. TEC has offices in Logansport, Fort Wayne, Indianapolis, and Muncie, Ind.

Modern Equipment Co., Port Washington, Wis., has appointed Dan Pendergast, as sales representative in New England for its line of cupolas, chargers, ladles, etc., with headquarters at his office in Waltham, Mass.

Lawrence Refractories, Pedro, Ohio, has appointed Conreaux & Co., 3637 Farnsworth Ave., Indianapolis, Ind., to distribute its refractory products in Indiana, eastern Illinois, and northern Kentucky.

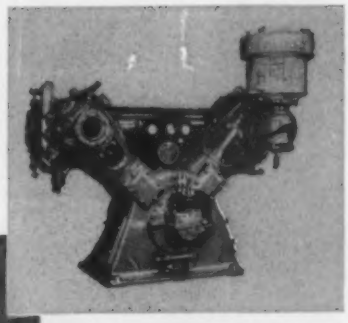
Booz, Allen Methods Service Inc. has been formed as an associated corporation by Booz, Allen & Hamilton, management consultants. The new company will provide consulting services to increase productivity and lower costs. Initially, branch offices will be opened for the new company in New York, Chicago, and Los Angeles.

Industrial Heating Equipment Association reports 1960 domestic orders for industrial heating equipment totaled $76.6 million, off 29 per cent from the 1959 volume. Foreign orders of $10.4 million topped the 1959 total slightly.

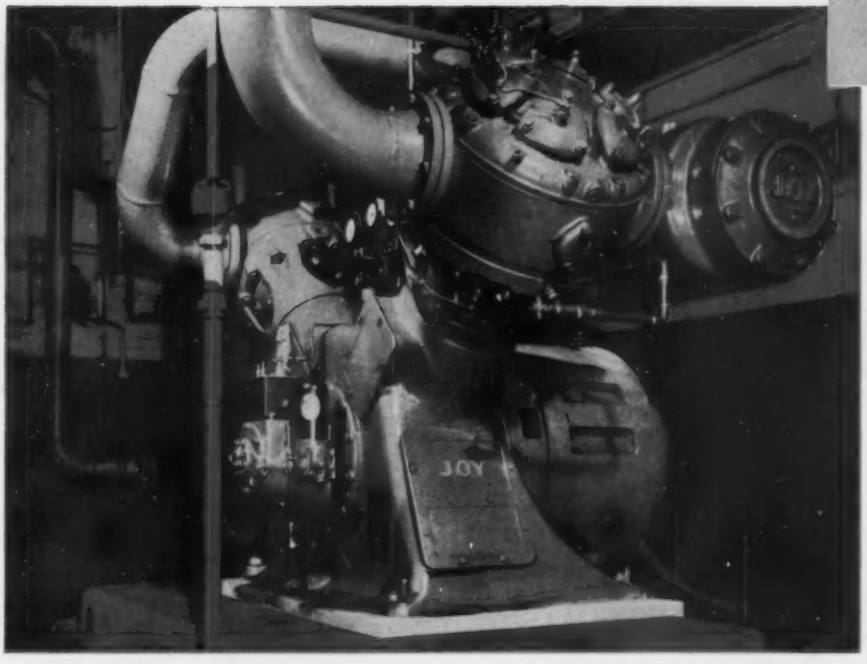
Chicago Gray Iron Founders Discuss Promotion Program

The quarterly meeting of the Chicago Area Management Executives Group of the Gray Iron Founders' Society, March 7, was devoted to a discussion of the society's proposed "Operation Vitalization," a long-range program for expanding iron castings sales. More than 20 Chicago area gray iron foundrymen attended the luncheon meeting at the Dania Society. Charles A. Daugherty, vice president, T. L. Arzt Foundry Co., chairman of the group, presided.

Walden G. Greenlee, president, Greenlee Foundry Co., Division of Greenlee Foundries Inc., Chicago, led the discussion of the advertising and promotion program which has been proposed by the society's advertising committee. Purpose of the program would be to create a favorable attitude toward gray iron castings among design engineers, production executives, purchasing agents and top management.



Compact design means simple installation. Set up on a simple block foundation, bolt down and connect air and water lines.

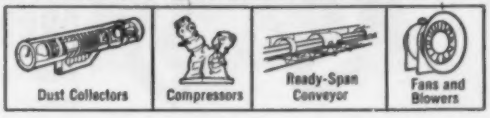


the COMPACT compressor with big compressor features... Joy WN-112

Only the package designed WN-112 has such heavy-duty features as replaceable cylinder liners and crosshead guides. These liners are made of special alloys which make possible fine machining and mirror-like polishing. The crosshead has no wedges, set screws or shims—never requires adjustment. The main bearings never need adjustment either because they are anti-friction, heavy duty ball, or spherical roller type. These, and other big compressor features add up to trouble-free performance that has made friends of literally thousands of plant and power engineers throughout industry.

When you are expanding your operations and require more compressed air, make sure you have details and complete information on the WN-112, one of a complete line of compressors for industry. You can then select any one of 24 standard models of the WN-112 plus special models for high and low pressures as well as oil-free operation. Capacities from 480 to 1072 cfm. Write for bulletin 606-13.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

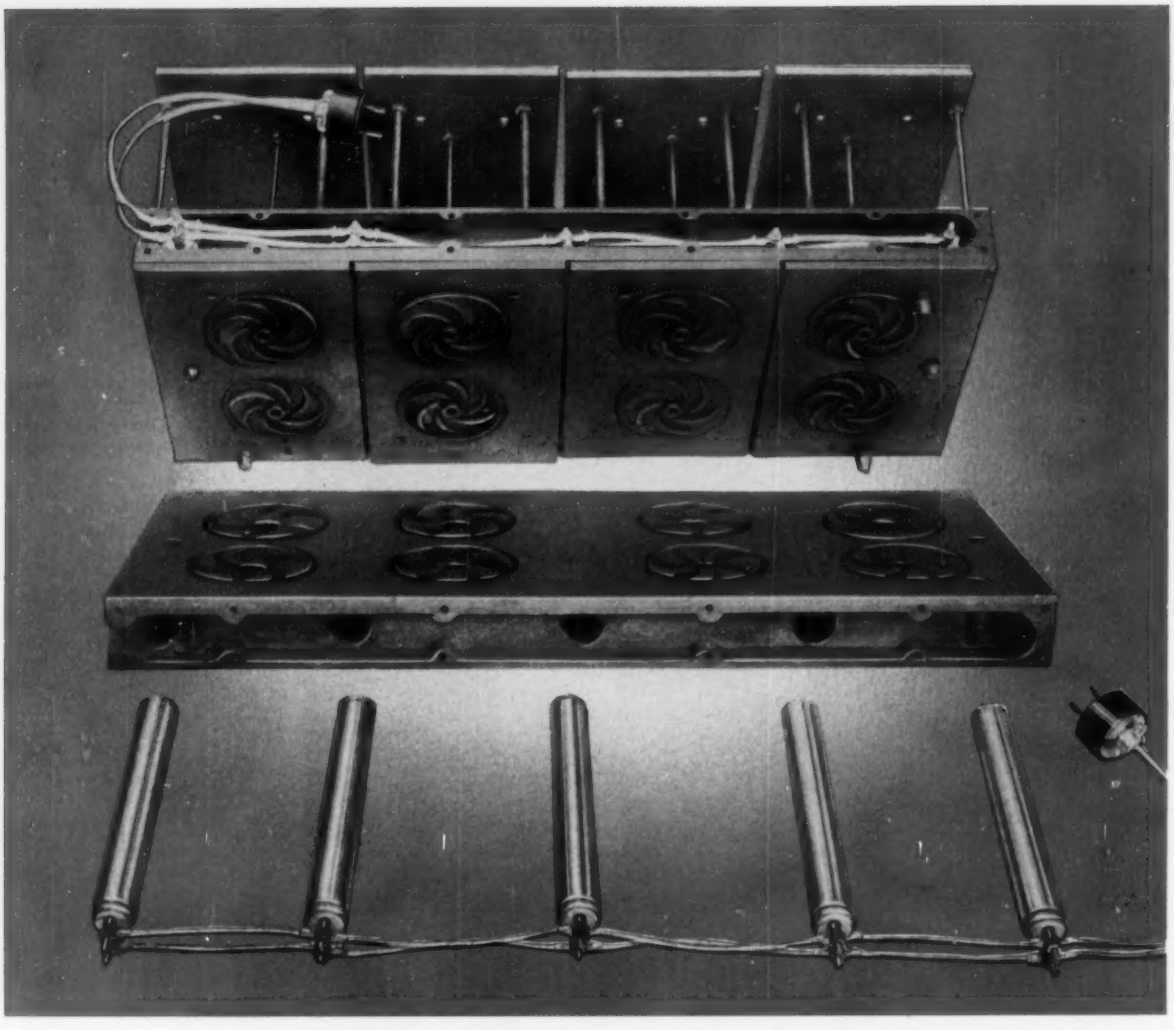


JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For More Information Circle 627, Page 39



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Engineers and Builders Of Automatic Foundry Equipment

C&S PRODUCTS COMPANY, INC.

18656 FITZPATRICK AVE.
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For More Information Circle 628, Page 39

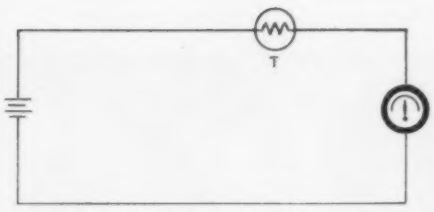


Fig. 1—This simple circuit is to measure temperatures

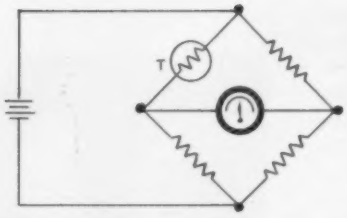


Fig. 2—A bridge circuit with thermistor raises sensitivity

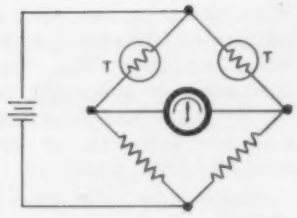


Fig. 3—Temperature differentials are gaged by this setup

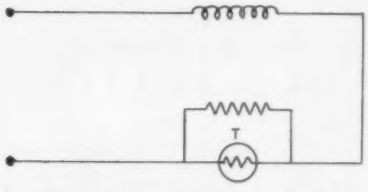


Fig. 4—Here, the thermistor is used to compensate a meter

There Are Foundry Uses for THERMISTORS

By HOWARD E. BAILEY
Universal Foundry Co.
Oshkosh, Wis.

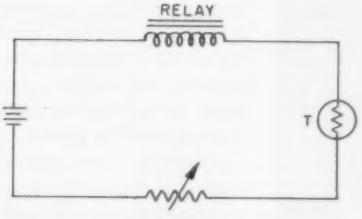


Fig. 5—Temperature control is the purpose of this circuit

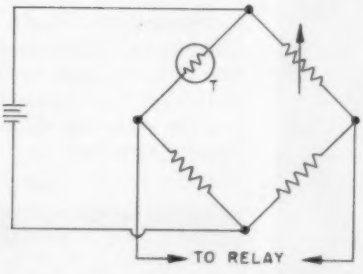


Fig. 6—A bridge circuit gives the best temperature control

● A HIGH negative temperature coefficient of electrical resistance is the property that makes thermistors or thermal resistors useful. Whereas heating of ordinary metals raises their electrical resistivity and cooling lowers it, temperature changes have opposite effects on the resistivity of thermistors. These semiconductors are made by sintering mixtures of oxides of manganese, nickel, cobalt, copper, iron, and uranium.

The characteristics of thermistors have been known for nearly 150 years, but only in the last 20 years have techniques been developed which permit production of stable units. Now they are made in the form of beads and glass probes, discs, washers, rods, matched pairs, and standard probe assemblies.

Many applications have been developed for thermistors, including several in the foundry. They are especially useful for measuring or control work. Important general applications included in the following discussion can be adapted to foundry uses.

Temperature Measurement — A simple circuit for temperature measurement consists of a battery, a thermistor, and a microammeter (Fig. 1). As temperature changes, resistance of the thermistor changes, and current flow through the meter can be calibrated in terms of temperature.

A more sensitive temperature-measuring circuit consists of a thermistor in one leg of a bridge circuit (Fig. 2). The meter can be a center zero galvanometer. The more sensitive the galvanometer, the shorter the temperature range indicated on the full scale of the meter.

A similar circuit, with two thermistors instead of one, can be used to make accurate temperature differential measurements (Fig. 3). If the two thermistors are placed in different locations, the unbalance

Fig. 7—Schematic shows how to rig a liquid level indicator

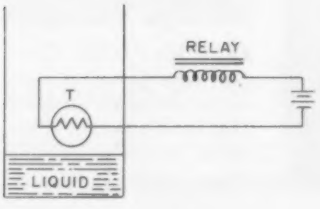


Fig. 8—The thermistor is used here to keep voltage constant

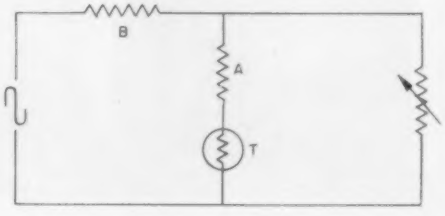
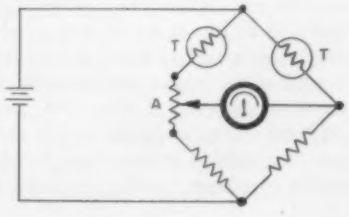


Fig. 9—Two bead-type thermistors are used for gas analysis



of the bridge is dependent on the temperature difference between the two thermistors. This circuit has been used on alternating current; output of the bridge feeds a high-gain amplifier with resulting accuracy of 0.001 degree.

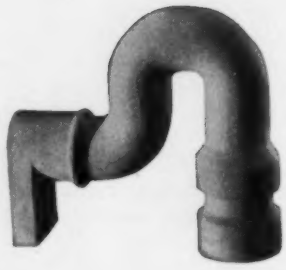
Temperature Compensation — Most circuit elements have a positive temperature coefficient of resistance such as copper in meter coil (Fig. 4). A thermistor can be used to compensate such a coil so that the meter resistance is substantially constant over a wide temperature range. The thermistor is shunted by a resistor so that the resultant negative temperature coefficient of resistance is equal to the positive coefficient of the copper. The total resistance of such a compensated circuit is only about 15 per cent greater than the uncompensated coil resistance.

Thermistors have been used to compensate magnetic amplifiers so that their gain remains constant. Transistor amplifiers have been compensated similarly to give a constant gain over a broad ambient temperature range.

Temperature Control—A simple temperature control can be made by placing a thermistor in series with the relay, a battery, and a variable resistor (Fig. 5). By adjusting the variable resistor, it is possible to make the relay operate at any desired temperature of the thermistor. The relay will close when the thermistor gets warm and close when it gets cold.

A more sensitive temperature control can be made by placing a thermistor in one leg of a bridge circuit and a variable resistor in the opposite leg, with a polarized relay across the bridge output (Fig. 6). When the thermistor becomes warm, the relay will operate in one direction; and when it becomes cold, the relay will operate in the other direction.

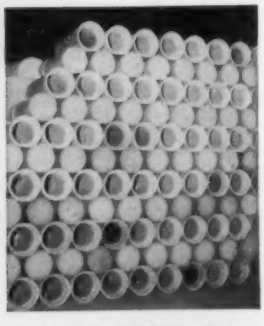
An efficient temperature control unit that has extreme sensitivity can be made by using the bridge as shown in Fig. 6. Alternating current is applied to the bridge, and the output is fed into a power amplifier with the relay across the output of the power amplifier. With an arrangement of this sort, the slightest variation in the bridge output is amplified many times by the power amplifier, making it possible



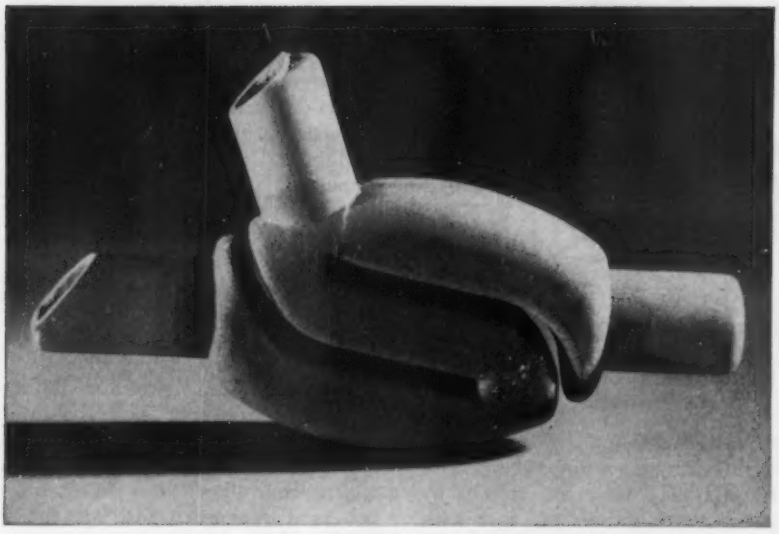
Foundry trims core costs by 1/3

More castings. Finer castings. *Castings that cost less to make.* That's the story in foundry after foundry where they use shell cores bonded with Durez foundry resins.

Once it took sixteen men to make oil sand cores at Lake Erie Foundry Company, Inc., Girard, Pa. A switch to shell cores made it possible to move ten of these men into more productive jobs elsewhere in the foundry. The remaining six men now turn out more cores than ever—and that's only the beginning of this foundry's savings.



EASY TO STORE. Cores now have smoother faces and come closer to specified tolerances. That saves costly machining. These cores can be piled



up in stacks for storage—a big saving in space. They're much easier to lift and move than solid sand cores. They don't have to be baked; they come out of the core box ready for setting and pouring. Altogether, the shell cores now cost *one-third less* than before.

"Durez resin has played an important part in helping us make these savings," declares Ford Daugherty, superintendent at Lake Erie Foundry. "Its drum-to-drum consistency enables us to keep product quality high. Durez representatives have helped us make major savings by reducing resin content of our cores to a very low percentage."

YOU, TOO? Can shell cores help your foundry show results like these? Your Durez representative will gladly help you look into the matter. His know-how can save time and expense. See him soon.

DUREZ PLASTICS DIVISION

1006 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

For More Information Circle 629, Page 39

to control temperature easily within an accuracy of 0.001 degree.

Liquid Level Measurements — When a thermistor is placed in series with a light bulb and a battery, the light operates if the thermistor is suspended in air. The thermistor heats up and the resistance drops, permitting enough current to flow to light the bulb.

If the thermistor is submerged in a liquid (Fig. 7), the thermistor is cooled because of the greater thermal conductivity of the liquid, and the thermistor resistance increases and reduces the current in the bulb enough to extinguish it. By substitution of a relay in place of the bulb, the device can be used as a liquid level control.

Voltage Control—As shown in Fig. 8, a thermistor with a suitable series resistor A can be placed in parallel with the load in a circuit to maintain constant voltage across the load. When the load resistance increases, the drop across resistor B tries to reduce, tending to raise the voltage across the load. The thermistor heats up and reduces its resistance so that more current flows through the thermistor and through resistor B, bringing the voltage across the load back to its original value.

Such controls can maintain as close as 1 per cent voltage regulation over a broad range of load resistance or over a broad range of supply voltages. Any voltage between ½ and 100 v can be regulated in this way.

Thermal Conductivity Instruments—If two small, bead-type thermistors are mounted in a bridge circuit (Fig. 9) so chosen that enough current flows through the thermistors to heat them up to about 150° C, they can be used in many instruments for measurement of various physical phenomena. If the two thermistors are placed in small cavities in a brass block, in which the gas can be changed, the unit becomes a gas analyzer.

If air is put in both cavities and the bridge is balanced by varying the setting of A, when the air in one cavity is replaced by carbon dioxide, the bridge is unbalanced because the carbon dioxide has a lower thermal conductivity than air. The thermistor then becomes hotter and lower in resistance.

The amount of unbalance thus

represents 100 per cent CO_2 in the analyzer. Fifty per cent CO_2 will give just half the meter reading, and the instrument therefore can be calibrated with a linear scale to read in per cent CO_2 in air. Similar calibrations can be made for any other mixture of two gases. Such an instrument has been made without using amplifiers to have a full-scale reading of ½ per cent CO_2 in air.

If the same bridge is made with one thermistor sealed in a cavity in a brass block and the other thermistor in a small pipe, it can be used as a flow meter. When no air is flowing through the pipe, the bridge can be balanced. When air flows through the pipe, the thermistor is cooled and its resistance increases, unbalancing the bridge. The amount of cooling is proportional to the flow of air, and the meter can be calibrated in terms of flow in the pipe. The same instrument can be used to measure the flow rate of any gas or liquid. Such instruments have been made to measure flow rates as low as 0.001 cc per minute. One instrument can measure flow rates of over 100,000 to 1 or more, merely by switching resistances in series with the output meter.

"Now here's a real tricky gating system"

If this instrument is made with the sensing thermistor held in free air, it becomes an anemometer capable of measuring air velocity from the slightest breeze to a gale and can be calibrated in terms of miles per hour of wind velocity.

If one of the thermistors is mounted in a sealed evacuated bulb and the other is mounted in a chamber connected to a vacuum pump, it can be calibrated as a vacuum gage in terms of millimeters of mercury. When the chamber is pumped down to high vacuum and the bridge is balanced, output is obtained when the chamber is not at high vacuum because air cools the thermistor and raises its resistance. Such vacuum gages are useful from about 1 mm of Hg to about 10^{-5} mm.

These are only a few of the multitude of applications for thermistors. In foundries, thermistors have proved themselves in such applications as temperature compensation, automatic moisture controls, sand mixers, controlling spray heads on hot sand conveyors, fast and accurate cupola blower air control, and many other uses limited only by the imagination of the engineering personnel.

The author would like to express his appreciation to Fenwal Electronics Inc., Framingham, Mass., for technical assistance in the preparation of this article.

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exothermic and metallurgical products . . . . . .
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Here is promotion opportunity! The FERROUS METALS Book represents a *single* way to achieve *multiple* influence on the men who make the important materials decisions in the giant Original Equipment Market. Over 55,000 Design Engineers will receive copies, in over 15,000 establishments.

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Each worksheet in the Design Data section will contain descriptive information on:

1. Analyses
2. Physical properties
3. Characteristics
4. Available forms
5. Hardening and heat treating
6. Fabrications
7. Information on stock forms
8. Applications

The Manufacturers Directory in The FERROUS METALS Book is being developed through direct co-operation with you and other ferrous metal producers and fabricators . . . to insure the latest and most complete listing possible. It will be divided into these categories:

1. BASIC FERROUS CASTINGS

Gray Iron
Ductile (Nodular) Iron
Malleable Iron
Carbon Steel
Low-Alloy Steel
Corrosion-Resistant Steel (ACI types)
Heat-Resistant Steel (ACI types)

2. SPECIAL ANALYSIS FERROUS METALS

3. BASIC WROUGHT FERROUS METALS

4. FORMED AND WORKED FERROUS METAL PARTS

Also included in the Directory will be a listing of producers and manufacturers and their identifying tradenames.

You may place full, two-thirds, and vertical one-third advertising pages on your products in the editorial portion of any of the four categories in the Directory, in which they fit. The editorial listing, then, will carry a line directing readers to your ad for this type, in that section. In order to take advantage of this tie-in listing, be sure your ads are in our hands *by June* 22, 1961 . . . which is six weeks prior to publication date.

Design Engineers will thus have "how-to" data as well as source of supply in *one*, clearly organized reference manual. Each ad will be given an Item Number and all the numbers will be listed on a Reader Service card to provide a quick and convenient means for further information on your products.

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Penton Building
Cleveland 13, Ohio

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(*Editorial Section rates)

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- ☐ Basic Wrought Metals
- ☐ Formed & Worked Ferrous Metal Parts

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FOUNDRY DEVELOPMENTS

Contaminates Brass

POINTING out that harmful effect of aluminum and silicon in 85-5-5-5 alloy is known but little fundamental information is available, Shigeo Oya and Umewo Honma investigated "The Effects of Small Contaminations of Aluminum and Silicon in the 85-5-5-5 Brass" and reported results in the *Report of the Castings Research Laboratory,* Waseda University, Tokyo, Japan.

They found that aluminum in the range 0.05 to 0.1 per cent forms aluminum oxide suspensions which clog the passageways between crystals during solidification and impede feeding. With 0.3 to 1 per cent aluminum the mode of solidification is somewhat similar to skin formation, which results in successful mass-feeding.

Silicon within the range 0.005 to 1.0 per cent is suspended in the molten metal as silica or silicate. It also extends the freezing range so much—due to solution in the metal—that the mode of solidification is similar to that of long-freezing type metals. This condition results in poor mass feeding. Conditions are not changed by larger additions of silicon.

Steel Is Tough

NICKEL alloy steel reported to possess excellent toughness at high strength levels has been developed by scientists of International Nickel Co. Inc. It is said to achieve a yield strength in excess of 250,000 psi at a nil ductility temperature of below minus 80° F, and to have a notched tensile strength exceeding 400,000 psi measured with a notch radius of 0.0005 in.

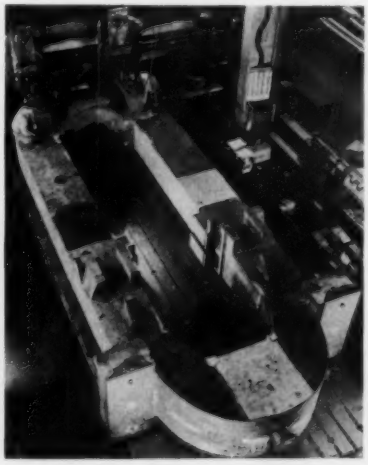
The steel is reported to develop its high strength while maintaining ductility and toughness by an easy heat treatment involving age-hardening of martensite. Treatment consists of holding for about three hours at 900° F and air cooling. Solution annealing at 1500° prior to aging is optional. Quenching is not required. Nominal composition of the new alloy is 18 Ni, 7 Co, 5 Mo, less than 0.5 Ti, and 0.05 max C.

Ram-off Defects

SEVERAL possible causes of ram-off defects in molds produced on machines are discussed in "Practical Notes on Ram-off Defects" by A. A. Timmins and A. D. Morgan in the March issue of *BCIRA Journal.* One is that with repeated impact and vibration the patterns may become loose on the plate. Again the machine may be out of level or the pattern may be incorrectly fitted.

In some cases the jolt table does not follow a true path due to the jolt piston having insufficient bearing surface or too much clearance. The machine may jolt unevenly due to wear, in which case the anvil does not take the impact squarely and the load receives a side kick. There may be squeeze head movement due to excessive play in the head bearings. Overloading can produce such movement.

Use of lightweight flasks is known to produce ram-off defects due to the flask leaving the pattern for a brief instant at the top of the stroke, and then impacting the pattern at a later time in the jolt cycle.



Over 250 tons of open hearth alloy steel was poured in the Mesta Machine Co. foundry, West Homestead, Pa., to produce this mill housing. It is 37 ft high, 16 ft wide, and is one of a pair of housings for the world's largest plate mill to operate at U. S. Steel Corp., Gary, Ind.

Rare Earth Systems

PARTIAL constitutional diagrams established for 16 binary systems containing rare earth metals, and a discussion of the tensile, compressive, fatigue and impact properties of those metals and their alloy systems are presented in two Air Force research reports available from the Office of Technical Services, Business and Defense Services Administration, U. S. Department of Commerce, Washington 25.

One is designated PB 171,085 and titled "The Metallurgy of Yttrium and the Rare Earth Metals, Part 1, Phase Relationships" by B. Love. Price is $3.50. The other is "The Metallurgy of Yttrium and the Rare Earth Metals, Part 2, Mechanical Properties" by B. Love. It is designated PB 171,086, and the price is $2.

Gray Iron Shrinkage

SHRINKAGE defects in gray iron castings may result from casting expansion in soft molds, unsuitable chemical composition, incorrect pouring temperature, and degree of eutectic nucleation in the iron.

These factors are discussed by Fuller and Nicholas in "Examining the Causes of Shrinkage Defects in Grey Iron Castings" in the March, 1961, issue of BCIRA Journal (Birmingham, England).

They point out that the most important single factor affecting soundness is the carbon equivalent of the iron. For light-section castings it should be slightly in excess of 4.3, and for medium-section castings it should be lower. In heavy-section castings the carbon should be as high as possible and the carbon equivalent slightly hypereutectic.

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For More Information Circle 632, Page 39

Jack C. Miske, associate editor, FOUNDRY, left, lines up coverage at the opening pattern session. From left to right, R. L. Olson, Dike-O-Seal Inc., session co-chairman; W. E. Mason, Westinghouse Air Brake Co., session secretary; R. M. Ronne, Dependable Shell Core Machines Inc., speaker; J. M. Kreiner, National Malleable & Steel Castings Co., chairman of the session

Extensive Program Presented at

A F S Technical Sessions

● MORE THAN 120 papers were presented at technical sessions of the 65th AFS Castings Congress, held May 8-12 at the Sheraton-Palace Hotel, San Francisco. The program included 45 sessions presented by AFS divisions and general interest committees plus six shop courses and six roundtable luncheons.

An interesting aspect of the program is the pronounced change in emphasis which took place this year in papers presented by divisions representing the various cast metals.

This shift saw a decrease in the number of ferrous metal papers, with the exception of those pertaining to steel, as contrasted with those presented by the nonferrous metal divisions.

By divisions, the number of papers presented were as follow: Gray Iron 6; Malleable Iron 4; Ductile Iron 6; Light Metals 14; Die Casting and Permanent Mold 11; Brass and Bronze 9; and Steel 19. In addition, the Steel Division co-sponsored with the Fundamental Papers Committee a vacuum melting and casting symposium at which seven papers were offered.

Individual roundtable luncheons were conducted by the Light Metals, Die Casting and Permanent Mold, Brass and Bronze, Steel, and Pattern Divisions. In addition, the Gray Iron, Malleable Iron, and Ductile Iron Divisions met at a joint luncheon. Shop courses included two each by the Gray Iron and Sand Divisions and one each by the Pattern and Ductile Iron Divisions.

The following pages present summaries of papers on brass and bronze; light metals; patternmaking; heat transfer; safety, hygiene, and air pollusion; malleable iron; industrial engineering and cost; and gray iron. Remaining summaries will be presented next month.

Opening session of the Brass and Bronze Division. Left to right on speaker's platform are George Stewart, East Bay Brass Foundry; Robert A. Colton, American Smelting & Refining Co., and R. C. Stokes, Specialloy Inc.

At the first light metals session, Associate Editor Robert H. Herrmann, left, checks a note on his coverage of the meeting with Samuel Lipson, Frankford Arsenal, secretary of the session, as Hyman Rosenthal, Frankford Arsenal, session co-chairman, and Merton C. Flemings, Massachusetts Institute of Technology, chairman of the session, right, watch

Gray Iron

● IN THREE SESSIONS devoted to gray cast iron a variety of subjects were covered. They included the direct reduction process for making iron, use of calcium carbide, inoculation, chill behavior, and use of stress analysis. The program also included a joint roundtable luncheon with the ductile iron and malleable iron foundrymen. Papers included:

Dwight Lloyd McWane Process for Making Foundry Iron, by T. E. Ban and C. D. Thompson, McDowell Co., Cleveland, and B. W. Worthington, McWane Cast Iron Pipe Co., Birmingham. Presented by Messrs. Ban and Worthington, the paper described the process which involves the mixing together of coarse ground iron ore, noncoking coal, and limestone. The mixture is formed into ½-in. moist balls which are dried, ignited, and sintered on a traveling grate. Sintered material is charged into a submerged-arc electric furnace and converted into iron. By selection of suitable raw materials, iron of any desired composition can be made.

Use of Calcium Carbide in Acid Cupolas by R. Schulze, Knapsack-Griesheim AG., Knapsack bei Koeln, Germany. Presented by Ralph A. Clark, Union Carbide Metals Co. Div., Union Carbide Corp., Cleveland, it described the use of special calcium carbide containing about 30 per cent carbide.

The material has a considerably lower melting point than regular calcium carbide, and indications are that it can be used successfully to obtain higher temperature in the iron, or to reduce the amount of coke between iron charges while maintaining satisfactory metal temperatures. Amount employed is 2 per cent of the coke weight.

Influence of Inoculation on the Structure of Gray Iron at Various Equivalences by H. D. Merchant, L. E. Toriello, and J. F. Wallace, Case Institute of Technology, Cleveland, and presented by Professor Wallace. This progress report of the Gray Iron Division describes an investigation using calcium- and aluminum-bearing ferrosilicon additions to irons of various compositions.

Some conclusions are that those additions greatly decrease eutectic cell size of low-carbon-equivalent irons and that reduction action decreases with increasing carbon equivalence. Eutectic cell size is finer at the surface than at the center of the test bars poured. Effective inoculation with ferrosilicon always produces type A graphite.

Progress of Solidification in Inoculated and Uninoculated Gray Iron by H. D. Merchant, Owens-Illinois Technical Center, Toledo, O., and J. F. Wallace, Case Institute of Technology, Cleveland, and presented by Mr. Merchant. Through thermal and microscopic studies on inoculated and uninoculated irons of about 4.0 carbon equivalence, it was found that the eutectic solidification temperature range occurs at higher temperatures in the inoculated irons, and the thermal gradients across the casting section are slightly shallower during the eutectic solidification of the inoculated irons.

Inoculation delays formation of an air gap at metal-mold interface during solidification. At the same time there is a small temperature difference between mold and metal at the interface, a high eutectic freezing rate, and a delay in formation of a complete solid skin on the casting. Those and other factors aid in explaining the greater wall movement occurring in inoculated irons poured in green sand molds.

Some Factors Affecting the Chill Behavior of a Roll-type Cast Iron by R. W. Lindsay, Pennsylvania State University, University Park, Pa., and K. E. Pinnow, Crucible Steel Co. of America, Pittsburgh. Presented by Prof. Lindsay.

Investigation showed that increase of metal temperature from 2600 to 2900° F increases carbide stability.

Chill capacity decreases as the pouring temperature is reduced from metal temperatures above 2600°. Pouring temperatures have a marked effect on the structure of the white iron in chill test castings. Those poured at 2450° showed less columnar structure than at higher temperatures.

Development of Engine Castings by Experimental Stress Analysis by L. A. Grotto, International Harvester Co., Melrose Park, Ill., described the application of brittle lacquer to determine the stress areas and their extent in the crankcase, engine bearings and liners being developed for a high-speed automotive diesel engine.

After the stress areas were located, wire strain gages were attached to determine the actual strains involved. Through these means changes were made in design of the castings to provide suitable section thicknesses.

At the joint roundtable luncheon of the Ductile, Gray and Malleable Divisions, the annual award for the best paper on gray cast iron presented at this Congress was made to L. A. Grotto, International Harvester Co., for his paper mentioned earlier.

Bruce Simpson, National Engineering Co., Chicago, spoke on **The Foundry's Place in Our Future Economy**, and pointed out that although research is being carried on, it is of narrow interest. He suggested a program of centralized research which would benefit all foundries as well as one for sales promotion with the same purpose.

Patternmaking

● THE PATTERN DIVISION program consisted of three technical sessions, which included five technical papers and a movie, and a roundtable luncheon. Subjects covered included machining of metal patterns, low melting point alloys for pattern use, polyurethane plastics in patternmaking, hot coreboxes, aluminum pattern castings, and apprentices. In addition, two shop courses were offered and were devoted to green sand properties and furfural binders.

Machined Patterns Can Be Competitive, by Roy Olson, Southern Precision Pattern Works Inc., Birmingham. Presented by R. M. Ronne, Dependable Shell Core Machine Inc., Portland, Oreg. Patternmaking innovations have become increasingly common in recent years. Foundrymen, who regard patterns as a necessary evil, try to use new developments to eliminate patternmakers so far as possible.

In spite of this attitude and regardless of new processes, machined production metal pattern equipment still represents the best available. Pattern progress therefore might best be considered in terms of using the time-proved pattern materials processed by faster, cheaper, more accurate methods. Pattern shops, however, have not taken advantage of developments in the art of stock removal or machining.

In the past, as many as a half-dozen trips between layout, machine, and bench have been required. These operations have built up most of the cost of producing metal production pattern equipment and have delayed delivery of patterns to foundries, which have ever shorter time requirements. In addition, operations of this type require highly skilled workers.

Major factors in a solution to this problem are better pattern engineering and automatic duplicating machines. Machines that remove metal at much faster rates than before possible and that reproduce from a model to close tolerances must be used. In addition, two or more spindles can be used. Only hand cleaning and polishing then are needed.

Low Melting Alloys for Pattern Fabrication and Other Uses in Pattern Shops, by O. J. Seeds, Cerro Sales Corp., New York. Low melting point alloys are based on the action of bismuth as a temperature depressant. Combined with bismuth, lead and tin melt at less than 300° F. An alloy composed of bismuth, lead, tin, and cadmium melts at 158° F, and the addition of indium to this alloy lowers the melting temperature to 117° F. These alloys also have useful shrinkage and expansion characteristics which can serve many valuable purposes. Various compositions contract, stay the same, or expand at different rates.

Foundry uses of these alloys include such applications as making duplicate patterns, making metal facings, salvaging worn coreboxes, and making alterations and repairs. They also can be used as teaching aids to demonstrate the foundry processes without elaborate equipment.

New Concept in Plastic Patternmaking (Polyurethanes), by Harry Burton, Canadian Steel Foundries, Montreal. Presented by R. L. Olson, Dike-O-Seal Inc., Chicago. Hard chromium plating is the ultimate in abrasion resistance, but its cost is high, and the process has size limitations. The new answer to the problem of abrasion resistance is polyurethane, which makes possible the addition of resistant material at wear points. Polyurethanes appeared more than 100 years ago, but have gained applications only recently. They now are in wide use for many purposes.

Their desirable features include excellent adhesion, ease of preparation, and fast cure. They do not separate from a base material and possess physical characteristics such that they resist load and shock enough to combat abrasion in pattern equipment. On the bad side, they are hygroscopic, and all moisture must be eliminated from molds. On wood, they take a long time to cure—up to 14 days at room temperature. On metal, heat transfer permits fast, even cure. Shrinkage is about 116 in., and 0.005-in. tolerances can be achieved easily. Preparation is not difficult, but it requires experience and care. Pot life ranges from 30 seconds to 30 minutes and averages 3 minutes. Polyurethanes also can be toxic. When proper types of formulations are used, these materials can be machined.

This session was concluded with presentation of a motion picture, "Application of Polyurethanes for Patternmaking," narrated by Ralph W. Smith, Dike-O-Seal Inc.

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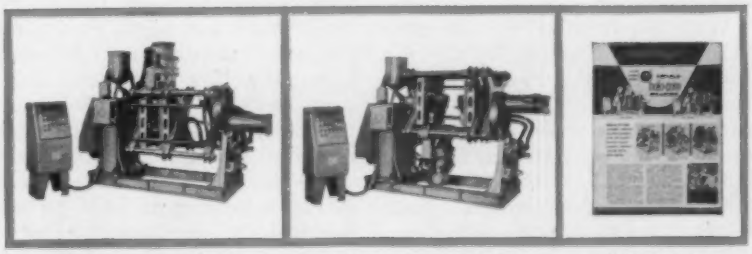

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terns, by G. E. Garvey, Garvey Pattern & Mfg. Co., South Bend, Ind. Patterns and castings from local contest winners are sent to Chicago to Ralph E. Betterley, AFS, and Prof. Roy Schroeder, Navy Pier Branch, University of Illinois. After all have arrived, about 20 foundrymen and patternmakers within a 100-mile radius come in to spend a day judging them. Entries are judged on individual percentage bases, which are totaled later.

Wood patterns are judged for workmanship, moldability, accuracy, and time spent, with the latter factor the least important. Metal patterns are judged for essentially the same points.

In the molding competition, a common pattern is used for all metals. The problem each year is to come up with a light pattern, with variable sections, so designed that it can be molded in more than one way. Castings are judged on general appearance, gating and risering, accuracy, and similar factors.

The apprentice contest serves a valuable purpose because the industry needs good apprentices.

Hot Core Box Design and Engineering by E. E. Harkess, Ford Cleveland Foundry, Cleveland, described practices followed in his firm's plant with phenol and furfuryl binders. Boxes are made of cast iron stabilized by heating to 1550° F for at least 30 minutes, furnace cooling to 1000°and holding for 1 hour, and then air cooling.

Cavity walls are $\frac{7}{8}$ in. thick with stiffening ribs, and where faster heat transfer is required, copper alloy inserts are employed. Factors relating to expansion and contraction of metal and type of sand mixtures used must be considered in designing of coreboxes.

Aluminum Pattern Castings by Walter E. Sicha, Aluminum Co. of America, Cleveland. Aluminum alloys have light weight, are easily machinable, possess good heat conductivity, and have good abrasive resistance. These factors are advantageous for a pattern material. One alloy suited for such work contains 7 per cent Cu, 5 per cent Si, 0.15 per cent Ti, and remainder Al.

Problems sometimes encountered include shrinkage and porosity, warping during machining, etc. Proper gating and risering, including use of chills where necessary, will provide castings free from shrinkage. Freedom from gas porosity requires a good quality alloy which must be melted under conditions which minimize gas pick-up.

Brass and Bronze

● FOUR technical sessions and a roundtable luncheon comprised the activities of the Brass and Bronze Division. Among subjects covered in nine papers were welding and weld repairing, gating, melting practice, and chemical composition and mechanical properties of copper-base alloys.

Weld Repair of High Strength Yellow Brass Castings, by D. K. Fox, Westinghouse Electric Corp., East Pittsburgh, Pa. Experimental and production welding with oxy-acetylene and inert gas shielded arc processes—using several different filler metals—demonstrated that satisfactory high-strength, high-ductility welds can be obtained in high-strength yellow brass castings.

The most satisfactory results were obtained by shielded arc with base metal composition filler and high-manganese aluminum bronze alloy filler. Such welding permits design latitude since a number of small castings can be welded together in complex shapes in place of casting as a single unit.

Compositions and Microstructures of Consistently Weldable As-Cast Nickel-Aluminum Bronze, by S. Goldspiel and M. L. Foster, supervisory metallurgists, Material Laboratory, New York Naval Shipyard, Brooklyn, N. Y. The potentials of nickel-aluminum bronze for propeller castings, including good mechanical properties and excellent cavitation resistance, could be enhanced by a determination of compositions and structures which give consistently weldable as-cast material.

This is a report of the first phase of an investigation designed for this purpose and deals with the relationship between aluminum content, mechanical properties, microstructure, and weldability. The sample material included conventional keel blocks and specimens taken from a groove-welded wedge-block casting, grading in thickness from $\frac{1}{2}$ to $3\frac{1}{2}$ in., and simulating during welding the restraints which are encountered in actual propeller repairs.

Results of tests indicate that the minimum percentage of Al needed for a welded structure is close to 9 per cent, and that the optimum as-cast structure in the thickness range considered is obtained with 9.5 per cent Al at 5, 4 and 0.5 per cent Ni, Fe, and Mn, respectively, which were kept relatively constant. Pb and Si, elements considered as detrimental, did not adversely affect weldability at levels of 0.10 and 0.18 per cent, respectively, in an otherwise optimum composition. Optimum mechanical properties obtained to date and relationships between metallographic structure, mechanical properties, and weldability were discussed.

The authors point out that of the several alloy types being considered for propeller castings, nickel-aluminum bronze is one of the more promising. Under optimum conditions, castings of this alloy type combine high strength and ductility with excellent corrosion resistance. To date, propellers of nickel-aluminum bronze as large as 50 tons have been cast for commercial use. Some propellers of this alloy type have been used successfully by the Navy in ships which operate under extremes in marine conditions.

This alloy is lighter than the high tensile brasses, and hence makes possible considerable savings in fuel consumption, reduced wear and tear on main propeller shafts and the use of thinner sections in design, due to its higher strength-to-weight ratio. Its resistance to corrosion allows propellers to retain smooth surfaces for a longer time, thereby increasing propeller efficiency and reducing maintenance costs. The major obstacle, reported for the alloy type, is that its fabricability, particularly bending and welding properties, often present difficulties.

Hard Spots in Aluminum Bronzes,

Circle 634, Page 39→

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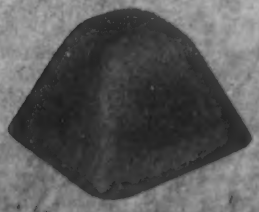

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by N. A. Birch, technical director, Albion Malleable Iron Co., Albion, Mich. Hard spots are small silvery, randomly located and intimately bonded inclusions, always round and up to ⅜-in. in diameter. They are near diamond hardness. Chemistry of the base metal doesn't seem to account for their formation, and remelting alone does not destroy them.

Although the nature, cause and cure of the defect still is a matter of speculation, inspection and shop procedures are recommended which virtually eliminate the difficulty. Sparkle, or silvery needles, are regarded as more dangerous than hard spots.

Electric Melting and Quality Control of Bronze Alloys, by R. V. Barone, research metallurgist, Research and Engineering Div., T. F. Godfrey, foundry superintendent, Braintree Works, and R. A. Rosenberg, chief materials engineer, Research and Engineering Div., Walworth Co., South Braintree, Mass. The bronze foundryman has always desired maximum yield from both his equipment and his time. To fulfill this wish and to obtain and maintain an operation at peak efficiency, a system of quality control which includes systematic reviews of all foundry operations is essential.

Quality control, beginning with the initial charge segregation, must be maintained until the completed casting leaves the foundry. It is of extreme importance to check on the condition of a casting in various stages of its production, for if a casting is made poorly in the foundry it becomes both useless and wasteful to perform any subsequent operations on it.

In melting bronze, it is imperative that deleterious impurities be minimized. Major impurities to be guarded against in melting tin bronzes and red brasses fall into two categories. The first includes metals such as iron, antimony, silicon, and aluminum which alter the foundry properties. Next are the nonmetallics such as sulfur, sand, slag and gases, including carbon monoxide, carbon dioxide, water vapor and sulfur dioxide.

These impurities may enter the melt either in the charge or from contact of other materials with the molten alloy. The former may be adequately controlled by proper segregation and cleaning of the charge, thus minimizing both mixed metal and gangue-forming materials. The latter source includes all substances which contact the molten metal. Furnace linings, ladle linings, skimmers, molds, slags, covers, and the atmosphere fall into this category and all should be as clean and dry as possible.

Purpose of this work was to devise a procedure for the close control of metal chemistry. In the method of quality control that was devised, the zinc losses of ASTM B62 (85-5-5-5) were found to be 0.8 per cent during melting, and procedures then were developed to replace these losses. The change in zinc content from 4.8 to 5.5 per cent produced an increase in the average yield from 16,250 to 16,750 psi, while exhibiting little correlation of the tensile strengths and elongations obtained from approximately 70 production tests per month. This resulted in savings of over $700 per month on raw materials and in improved consistency in alloy foundry properties and mechanical properties.

X-ray fluorescence was employed to monitor the zinc content of the 85-5-5-5 alloy for four months, in addition to approximately 70 wet chemical analyses per month over the 10-month testing period. Advantages of x-ray fluorescence as an accurate, rapid means of analysis were cited.

Properties and Microstructure of Cast Nickel-Containing Aluminum Bronze Alloys, by E. Belkin, Materials Laboratories, nonferrous application group, Westinghouse Electric Corp., East Pittsburgh, Pa. Data are supplied to assist the foundryman in selecting an aim point for aluminum content, and the information can be used for selecting the quenching and tempering temperatures according to the desired mechanical properties. It is pointed out that foundries can consistently produce high-quality, high-strength aluminum bronzes with a knowledge of the effect of alloying elements and heat treatment.

"I was holding the thermocouple when the boss's new secretary walked by"

Effect of Chemical Composition on the Structure and Properties of Aluminum Bronzes Containing Manganese, Nickel, and Iron, by J. O. Edwards and D. A. Whittaker, Department of Mines and Technical Surveys, Ottawa, Ont., Canada. There is considerable interest in Canada in high-manganese, nickel aluminum bronze. This alloy has characteristics of all of the standard aluminum bronzes. Nominal specifications call for 6-14 per cent manganese and 2-6 per cent nickel. The literature reveals little information on such material; consequently it was the objective of the investigation to develop comparative data.

The Vertical Gating of Bronze Valves in Shell Molds, by F. E. Murphy, G. J. Jackson, and R. A. Rosenberg, Walworth Co., South Braintree, Mass. Thin - walled bronze valves formerly were poured horizontally in green sand but production recently was converted to shell molds. Since the pouring of bronze pressure-tight castings differs from gray iron practice, this paper described how some of the problems were solved. It was not the intention to prove that vertical gating is superior to horizontal.

The test of a good gating system is the speed with which it can purge turbulence and expirated air from the mold and fill the cavities with metal. Present practice is to use a rectangular down gate and an up gate. Because the valves are thin walled, no risers are needed. Scrap loss is being held to 3 per cent.

Correlation of Physical Properties and Void Volume of Copper-Base Alloys with Morphology of Solidification — Brass and Bronze Research Progress Report—by R. A. Flinn, professor of metallurgical engineering, and H. Kunsmann, FEF

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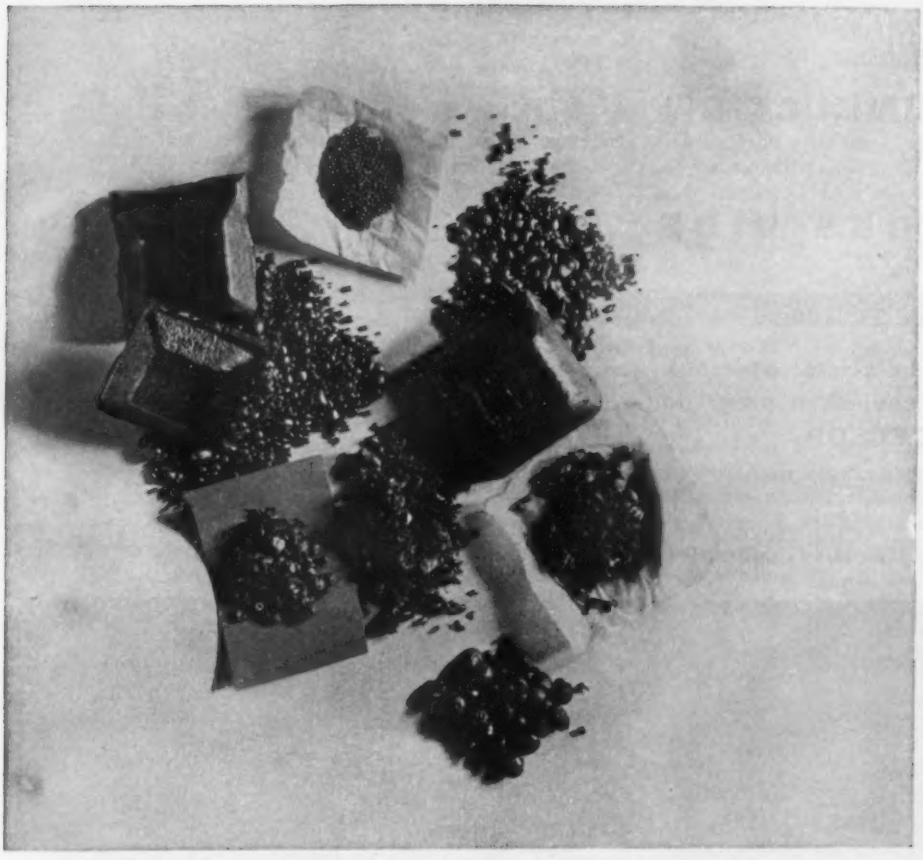

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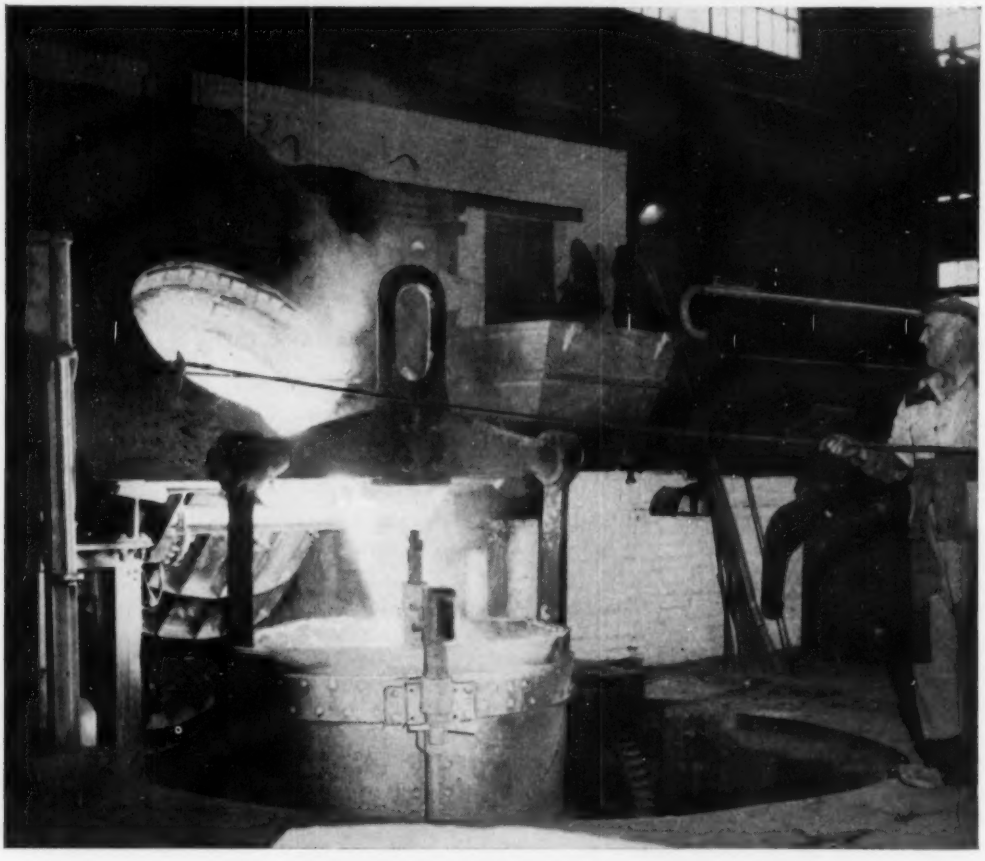

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Fusion, chauffage, traitement par induction, métallurgie sous vide, physique industrielle.

Scholarship student, University of Michigan, Ann Arbor, Mich. In previous work in this investigation, sponsored by the AFS Training and Research Institute under direction of the Brass and Bronze Division Research Committee, the immediate objective was to determine the conditions affecting pressure tightness of 85-5-5-5 castings.

The initial effort was directed toward this single objective because of the predominant use of this alloy and the widespread interest in the variables affecting leakage. It was established that to produce tight sections a strong thermal gradient (60° F in.) was required during the final stages of solidification of the matrix. A variety of shapes, section sizes, chill and riser designs was investigated to determine the thermal gradients and soundness of the castings.

On conclusion of this work the committee agreed that further investigation should follow two paths —(1) determination of the conditions of solidification necessary for development of maximum physical properties, including pressure tightness, in other copper-base alloys and (2) application of the solidification data to problem castings to illustrate their use. This paper is concerned with phase one.

The investigation dealt with the castability of alloys with a wide range of liquidus-solidus intervals, including 80-10-10, 85-5-5-5, 88-8-0-4, aluminum bronze, manganese bronze, silicon brass, and nickel silver. Using the end-chilled 12 x 2 x 2 in. test bar previously developed, the variations in density, leakage, microstructure, and mechanical properties were measured as a function of position in the bar.

The aluminum bronze and manganese bronze showed litle variation in density, no leakage or microshrinkage, and little change in mechanical properties. Surprisingly, the 80-10-10 and its silicon brass, materials with the longer liquidus - solidus intervals, also showed similarly good castability. The other mushy-type freezing alloys exhibited leakage, low density, microshrinkage and poorer mechanical properties, at the stations in the bar well away from the chill. A mechanism relating the large volume of low melting point liquid in the silicon bronze and the 80-10-10 to the morphology of solidification is proposed.

A New High-Strength Dezincification-Resistant Bronze Alloy, by A. H. Hesse, metallurgical engineer, R. Lavin & Sons, Chicago. Reason for the new alloy is the fact that municipalities—Los Angeles, as an example—are enacting tighter specifications for gate valve stems.

The alloy described has foundry characteristics similar to manganese bronze and aluminum bronze and resists dezincification and dealuminumization. A properly gated, risered, and chilled 6-in. valve stem has the same mechanical properties in critical sections as those available in the alloy prepared under test bar conditions. Typical properties are 65,000 psi tensile strength, 33,000 yield strength, and 25 per cent elongation.

At the Brass and Bronze roundtable luncheon, L. H. Durdin, president, Dixie Bronze Co., Birmingham, Ala., spoke on **Problems of Running a Bronze Foundry in 1961.** Among the problems he enumerated were men, money, management, materials, methods, and merchandising.

Of concern regarding materials is the rising cost of metals and alloys, a condition that is being stimulated by the growing scarcity of scrap because of the volume in which it is being exported. No relief for the situation is in prospect and Mr. Durdin asked what foundrymen will do if the exodus of scrap continues.

The speaker stated there are 2000 brass and bronze foundries in the U. S. and 65 per cent of them employ less than 15 men and 50 per cent less than 10. In many cases, the proprietors are men who formerly were molders for larger foundries with ambitions to own their own shops. Lacking resources for cost accounting and merchandising, these small shops often sell castings at uneconomical prices.

R. A. Colton, manager, American Smelting & Refining Co., Houston, Tex., is the new Brass and Bronze Division chairman, succeeding R. B. Fischer, metallurgist, Ingersoll-Rand Co., Phillipsburg, N. J. New vice chairman of the division and chairman of the Program and Papers Committee is F. L. Riddell, foundry metallurgist, H. Kramer & Co., Chicago. A. W. Bardeen, technical director, Ohio Brass Co., Mansfield, O., is the new vice chairman of the Program and Papers Committee.

Malleable Iron

● FOUR PAPERS, including two progress reports on research work, were presented at the two sessions sponsored by the Malleable Division.

Shooter, Ceroxide Cermet or Slag by C. A. Sanders, American Colloid Co., Skokie, Ill., H. J. Heine, Malleable Founders' Society, Cleveland, and R. F. Marande, Ohio Malleable Div., Dayton Malleable Iron Co., Columbus, Ohio.

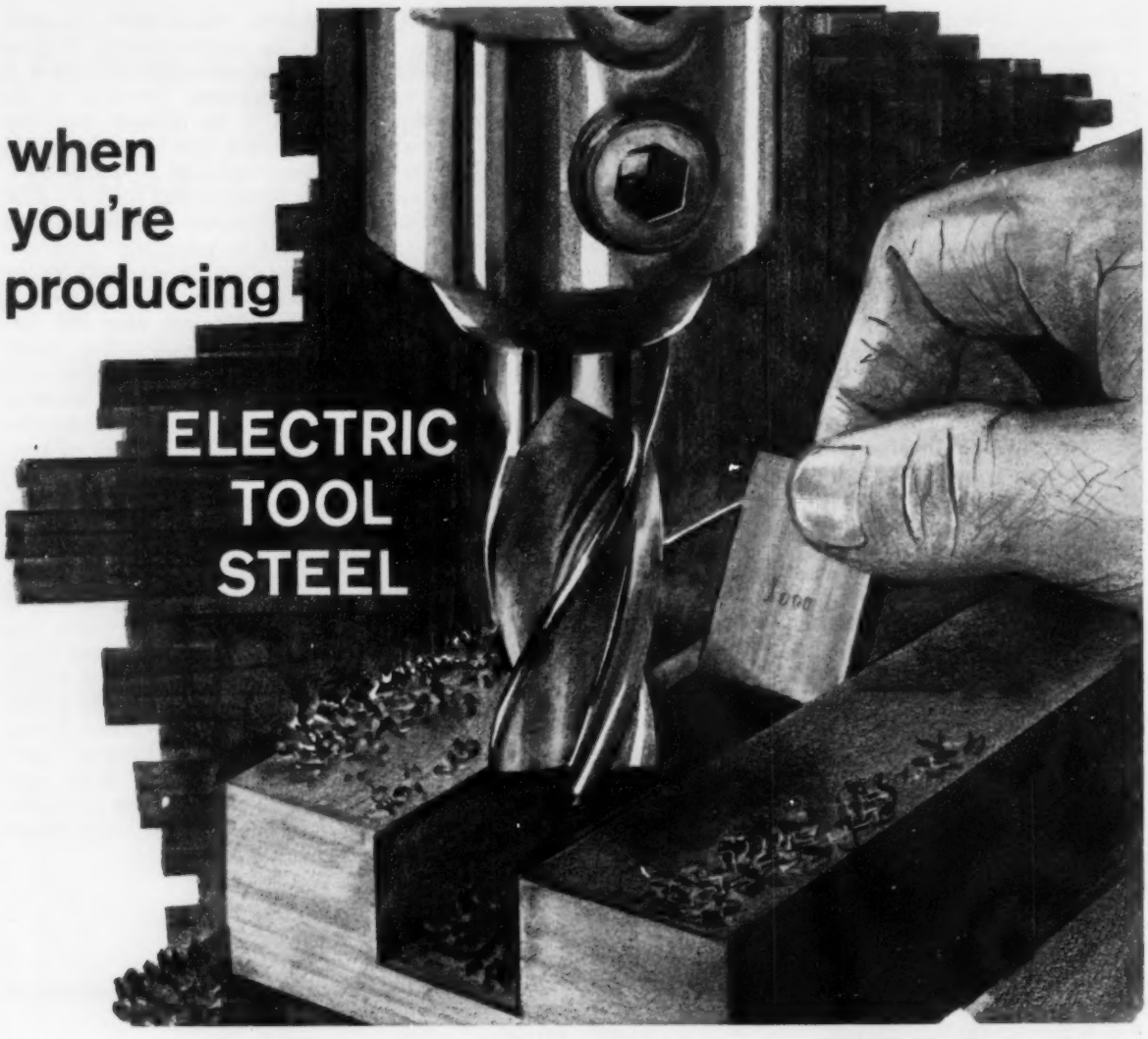
The defect sometimes referred to by steel foundrymen as snotters (terminology for this defect still is subject to debate) is attributed largely to low-eutectic slags. Their source lies principally in careless ladle practice.

When slag or oxidized metal is allowed to build up on the ladle lining, including the lip, trouble can be expected to develop in the castings. The major difficulty is experienced when FeO and MnO in the slag increase excessively.

These recommendations for correcting the problem were offered: Select a ladle refractory that does not contribute to formation of low-eutectic slag and line properly. Number each ladle permanently, keep a record of the number of times the ladle is filled, and establish the maximum number of heats permitted before relining. Be sure all iron is removed from the ladle before reheating. Skim slag from the metal thoroughly, particularly around the ladle edges.

In subsequent discussion it was pointed out that oxidizing conditions during melting will aggravate poor ladle practice. Oxidizing conditions can prevail if steel content of the furnace charge is too high.

Two progress reports on research sponsored by the Malleable Divi-



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sion were presented. The first, **Heavy White Iron Section Casting and Annealing** by R. W. Heine and T. W. Mueller, University of Wisconsin, Madison, Wis., and J. W. Widmeyer, Dow Chemical Co., Midland, Mich., was presented by Professor Heine. It covers chemical analyses of iron and additions to the melt for casting heavy sections so that no mottle spots appear on a fractured surface.

A marked reduction occurs in the number of graphite nodules developed during annealing as the as-cast section size is increased. This reduction in nodule number markedly extends the time required for first and second stage graphitization.

Chemicals added to prevent mottling include bismuth, tellurium, and cerium, but they do not increase the number of nodules in heavy sections during annealing. Factors which cause large increases in nodule number in lighter section castings seem to be much less effective in heavy sections. When thin sections are cut from heavy as-cast sections, they show an increase in nodule number compared to the heavy sections after annealing. Increasing first stage graphitization annealing temperature, however, shows no effect toward improving the nodule number.

The second progress report, **As-Cast Compact Graphite in Cast Iron**, by R. W. Heine, T. W. Mueller, University of Wisconsin, Madison, Wis. Presented by Professor Heine. This study was concerned with the production of compact graphite—as distinguished from flake graphite—in the as-cast condition. Chemical additions studied included cerium, tellurium, and boron with metal in both the desulfurized and sulfurized conditions. Metal composition included a wide range of both carbon and silicon.

Some investigations also were made with a combination of cerium and tellurium, and results in production of a compact type of graphite were similar to those resulting from use of magnesium and tellurium. In both instances, production of flake type graphite was repressed.

Influence of Some Trace Elements on the Graphitization Kinetics of Malleable Iron by G. Sandoz, B. F. Brown, Naval Research Laboratory, Washington, and W. A. Pennington, University of Maryland, College Park, Md. Presented by Mr. Sandoz.

This investigation examined the effects of bismuth, antimony, tin, lead, cadmium, and zinc on the free graphitization reaction of malleable iron. Although the effects of tin, lead, and cadmium vary with the manganese-sulfur ratio of the iron, the effects of bismuth and antimony do not change.

Irons having a low manganese-sulfur ratio are affected only slightly on first stage graphitization by tin, lead, cadmium, and zinc.

Second stage reaction of irons having low manganese-sulfur ratios are influenced by cadmium and zinc, and tin and lead promote the reaction in small amounts but move in the opposite direction in larger quantities. On the other hand, bismuth retards in all quantities. Irons with a high manganese-sulfur ratio are retarded in both first and second stage reactions by all of the trace elements except zinc, which was not studied. Trace elements have little influence on the indirect second stage graphitization of pearlite in irons with a high manganese-sulfur ratio.

Industrial Engineering

● FOUNDRY COSTS were discussed at two sessions sponsored by the Industrial Engineering and Cost Committee.

Establishing Work Standards by Sampling, a motion picture produced by the University of California, Berkeley, Calif., was shown after introductory remarks on the subject by E. C. Keachie of that school and Committee chairman E. C. Reid, Ford Motor Co. of Canada.

The film provides an informative presentation of how work sampling can help to set work standards, particularly for variable tasks. The method is less favorably adapted to highly repetitive work.

Survey Report, Industrial Engineering and Cost Committee, by J. A. Westover, Westover Corp., Milwaukee. A survey to ascertain the need for procedures in establishing cost estimates for pricing purposes was made through a questionnnaire sent to a number of ferrous and nonferrous foundries. Photos and drawings of two castings and their patterns—one simple and one complex—were sent to a number of foundries for their estimates of costs on various quantities of casting made of specified types and costs of metal.

Replies were received from brass, gray iron, malleable iron, aluminum, and steel foundries. Midwest variations in cost estimates were made by gray iron and steel foundries, the least by brass and aluminum producers. Foundries using standard cost methods appeared to reflect their costs more accurately than those which did not. Influence of the quantity of castings on which cost were estimated also varied rather widely among the different foundries.

Developing Standard Times for Use in the Job Foundry, by D. L. Raphael, Pennsylvania State University, University Park, Pa. Presented by A. B. Draper of Penn State. Standard elements of motion which make up an entire molding operation can be selected, and the time required for each—already available in the form of published reports based on previous research—can be assembled to provide an estimate of the time for the complete process. These times are adjusted according to the weight and distance moved in the specific operation.

This method obviates the need for extensive stopwatch measurement of all movements, although timing usually is required of those motions affected by machine operations. Time requirements also may be affected by process control, such as variations in time for pattern withdrawal according to complexity of the pattern. The solution in such cases is to treat this phase the same as a machine operation with actual timing. The system has been found valuable in permitting more accurate pricing.

Cost Control through Applica-

tion of Process Control, by C. E. Haney, Esco Corp., Portland, Oreg. Presented by W. R. Barber of Esco. A comprehensive system of controlling all processes resulted in a 40 per cent reduction in scrap castings between 1958 and 1960. Detailed data on molding and coremaking practices are tabulated when each new job is started, and brainstorming sessions after pilot heats are well under way provide suggestions for improving the processes.

Information developed on trial castings has proved useful in trouble shooting on production runs and in subsequent casting of similar parts. Spot checks are made periodically by inspectors of molding practices and equipment, and scrap reports point to instances where corrective measures are desirable. Patterns which end a run with a relatively high scrap record are flagged so that changes can be investigated and made before they are used again. The chief inspector often makes suggestions for corrective action.

Sand mixing and heat treating also are covered by the program. A power input chart provides an accurate check on whether the correct cycle of additions and mixing time is being followed in sand preparation.

Safety and Hygiene

● IN A SESSION on safety, hygiene and air pollution, B. Linsky and G. Aase, Bay Area Pollution Control District, San Francisco, discussed **Foundry Air Pollution in the San Francisco Bay Area.** They discussed the various studies made to determine the extent of air pollution and methods to keep it to a minimum.

Regulations on some phases of foundry operations have been devised and placed in effect. One affects discharge from the cupola. Use of filter bag houses and water spray cooling towers has brought this operation within the regulations.

Control of Dusts and Solvent Vapors from Shell Molding Operations, by E. B. Henby, National Dust Collector Corp., Chicago. Presented by H. J. Weber, AFS, Chicago. Shell molding operations involve conditions similar to those with sand operations relative to health and air pollution, but the use of resins provides the additional hazards of fire, explosion, dermatitis, and air contaminants such as formaldehyde, phenol, ammonia, etc. Application of exhaust equipment based on design data available in the society's *Engineering Manual for Control of In-Plant Environment in Foundries* was indicated as being satisfactory in shell molding and coremaking operations.

Light Metals

● FOURTEEN technical papers and a luncheon meeting were sponsored by the Light Metals Division. Subjects included casting reliability, uranium and new light metal alloys, fluidity properties, centrifugal casting, alloy treatments, and cellular metal production.

Meeting the Challenge of High Reliability Castings, by W. Babington, Bell Telephone Laboratories, Murray Hill, N. J.; E. E. Miller, Western Electric Co., Greensboro, N. C., and W. R. Clitherow, Western Electric Co., Winston-Salem, N. C. Presented by Mr. Babington.

Reliability today is the keynote in cast parts design. This is particularly true for missile and aerospace castings. Because of the demand for thinner sections, greater strength, closer tolerances, and more uniform high quality in finished components, Western Electric Co. was having difficulty meeting reliability requirements when buying castings from different foundries.

To remedy the situation, Western Electric surveyed foundries and gathered information on each foundry's equipment, casting processes, and ability to produce castings to a certain quality level. Four classifications of quality levels were set up and each foundry was categorized in one of those quality levels. The company now seeks bids only from those foundries which have the same capabilities for producing castings of a certain quality level.

Also, the company is very specific in its blueprint information describing castings so that there can be no misunderstanding about exactly what is desired. In addition, there is complete interchange of information with the foundries before the job is started. Since the program has been in effect, castings rejection rates in some cases have been reduced from a high of 40 per cent to less than 1 per cent.

A Preliminary Evaluation of M517-T61 as a High-Strength Aluminum Alloy Casting Material, by W. A. Bailey, E. N. Bossing, and F. H. Roebuck, Douglas Aircraft Co., Santa Monica, Calif. Presented by Mr. Bailey.

M517 is an Al-Si-Cu-Mg alloy believed to offer the advantages of lower pouring temperature and higher tensile properties in the T61 condition better than does alloy 356. The new alloy also is said to be less sensitive to chilling. Therefore, the production problems of placing chills in molds can be eliminated.

Results of test work to date are considered to be preliminary. The authors point out that considerably more work must be done to prove the preliminary results.

The Effects of Centrifugal Force on Substructure of Aluminum Alloy 356 + Be Permanent Mold Castings, by A. J. Iler, Northrop Corp., Norair Div., Hawthorne, Calif.

Machined test bars were produced from the poured end, center, and chilled outside end of rectangular castings poured statically and centrifugally at varying revolutions per minute. Test results indicated that centrifugal casting improves density and improves tensile properties of alloy 356 + Be.

Similar results were obtained with magnesium alloy AZ91.

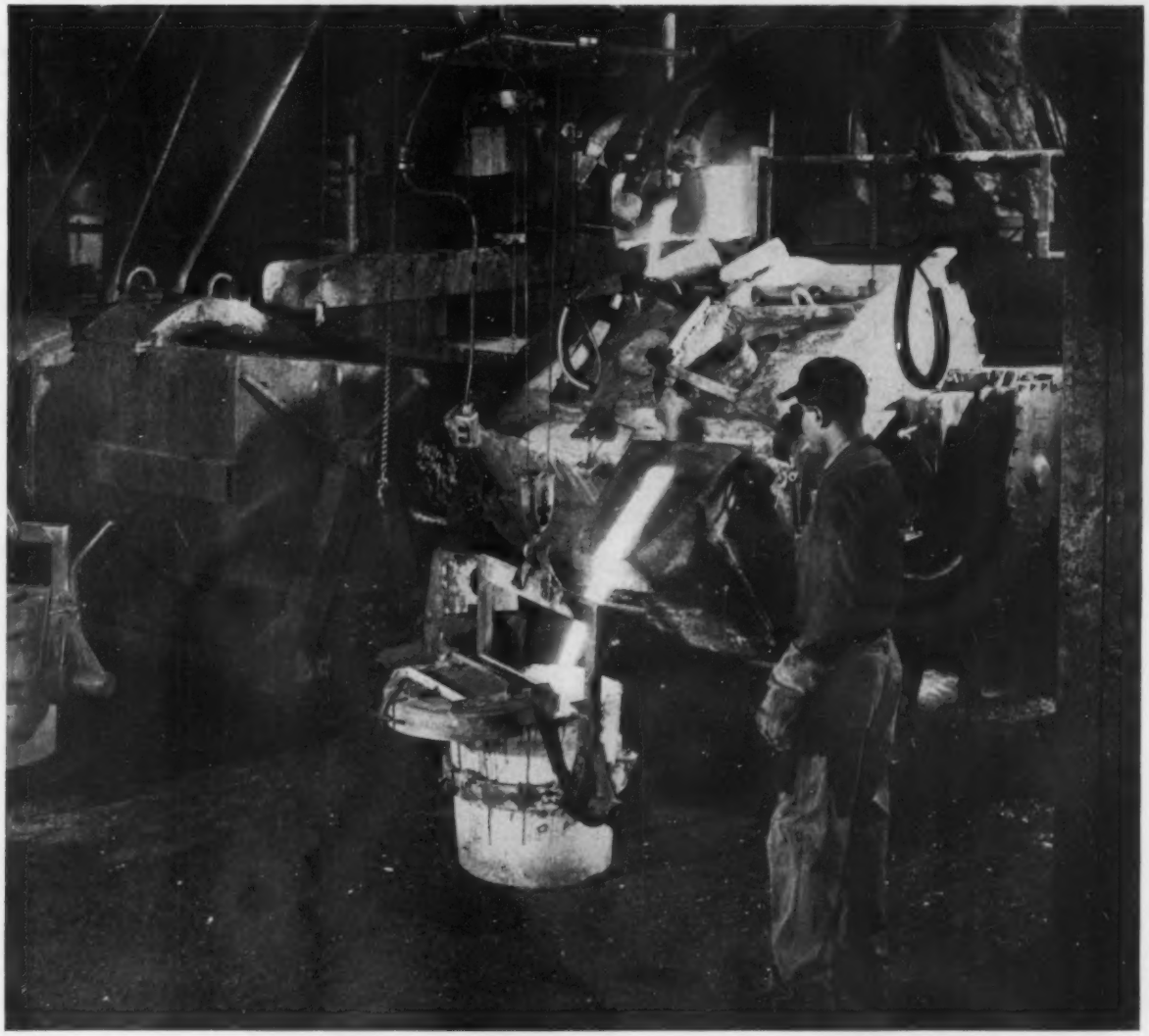
Influence of Mold Variables on Fluidity of Aluminum; Doubling Casting Ductility by Fluidity Control, by M. C. Flemings, R. F. Mollard, and H. F. Taylor, Massachu-

YOU POUR CLEANER IRON EVERY TIME . . .

if you use *Famous* CORNELL CUPOLA FLUX

for Gray Iron and Malleable Iron Foundries

A little Famous Cornell Cupola Flux, added to each cupola charge of iron, purges molten iron of impurities so that you pour clean metal every time. Furthermore, the iron is hotter, more fluid, and sulphur is greatly reduced. Many dollars are saved in cupola maintenance, too. Digging out is easier as drops are cleaner and bridging over is practically eliminated.



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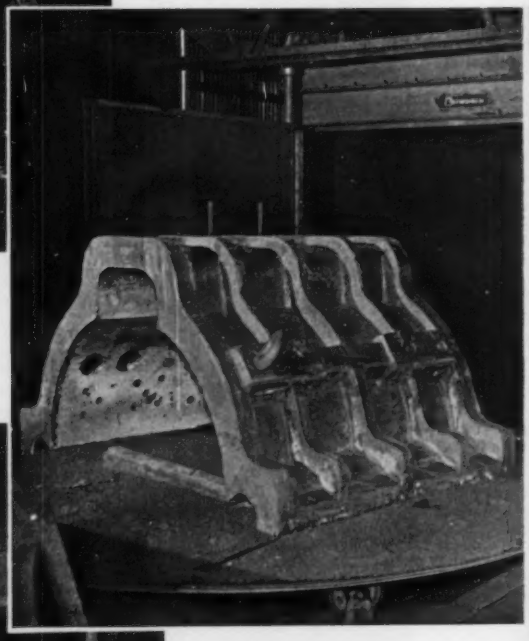
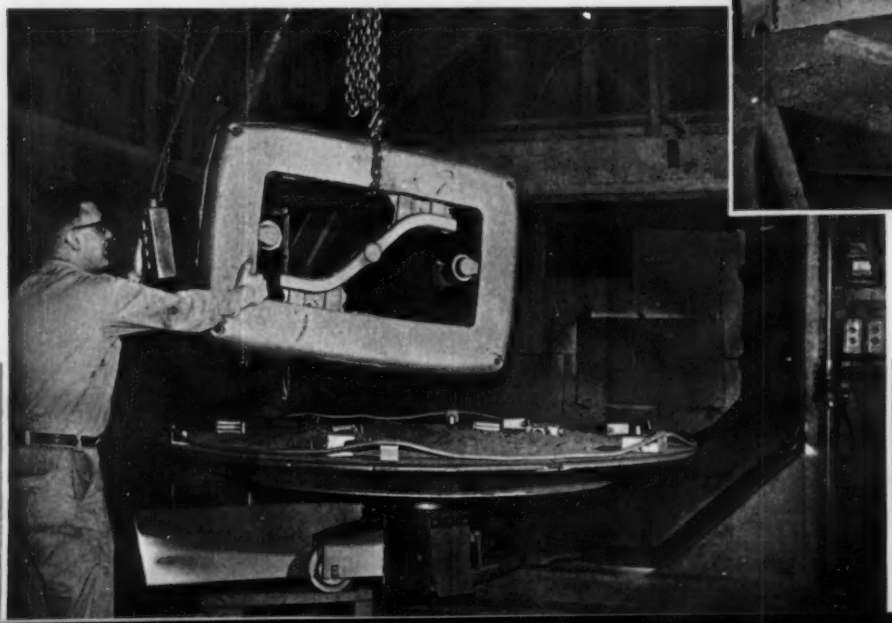
PHOTOS AND STATEMENT FROM

Ingot mold flask (for steel mill use) weighing 18,500 lbs., being inspected by Metal Blast's abrasive engineer, *prior* to blast cleaning with "SUPER-STEEL" shot.

The W. S. Hodge Foundry has been in continuous operation for 85 years — serving the industry with highest quality gray and ductile iron castings since 1876.



Ingot mold flask weighing 11,300 lbs., *after* cleaning with "SUPER-STEEL" shot.



Ingot mold hot top cover, 493 lbs., *after* cleaning with "SUPER-STEEL" shot.

"SUPER-STEEL" performance!

SHOT OR GRIT

THE W. S. HODGE FOUNDRY, GREENVILLE, PENNA.

The *unretouched* photos on the opposite page, taken recently in the HODGE FOUNDRY, should go a long way toward proving that "SUPER-STEEL" is doing an outstanding job of cleaning castings. For further affirmation, please read what W. S. Hodge has to say about their experience with this fine abrasive:

> ***"Metal Blast's "SUPER-STEEL" has substantially reduced costs on our blast cleaning operations over the steel shot we were previously using. We are very pleased with the cleaning and appearance of our castings and well satisfied with the abrasive engineering service provided by Metal Blast. We highly recommend "SUPER-STEEL" to all foundries interested in saving on their cleaning costs."***

If you're not entirely satisfied with the performance (or cost) of your present steel abrasives, why not try "SUPER-STEEL"? In addition to the excellent performance and service referred to above, you'll get greater "resistance to breakdown" and lower maintenance costs — yet you pay less for "SUPER-STEEL"! You can't help but cut cleaning costs — in fact, we'll guarantee it! Write, wire or phone collect — we'll rush a trial order, test sample, more information or have our abrasive engineer call.

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$165.00 PER TON TRUCK LOADS

Packed in 50 or 100 lb. bags, steel drums, pallets.

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For More Information Circle 639, Page 39

setts Institute of Technology, Cambridge, Mass. Presented by Professor Flemings.

Results of work on green sand molds in the third year of a continuing study on fluidity were reported. Molds were made in two halves with spiral cavities in each, fed by a central sprue. Mold materials and coatings could be different in each half.

Silica sand molds bonded with linseed oil, sodium silicate, or phenol formaldehyde, and zircon sand molds produced slightly shorter fluidity spirals than did green sand molds. Also, moisture content and additions of silica flour and sawdust had no apparent effect on feeding distance. Longer spirals were obtained in coarse green sand, AFS 30, than in AFS 140 sand. Mold coatings of hexachloroethane and of carbon black also improved apparent metal fluidity. This is attributed to their insulating power.

Apparent fluidity of a metal can be improved by providing greater metal velocity and by decreasing chilling power of the mold.

Magnesium-Silver-Rare Earth-Zirconium Casting Alloys, by D. L. Whitehead, Magnesium Elektron Ltd., Manchester, England.

Alloy QE22A has good castability. In the T6 condition it has 34,000 psi tensile strength and 25,000 yield strength, and good fatigue and creep characteristics. It has high properties at elevated temperatures and in thick sections.

Melting, Casting, and Heat Treatment Techniques for Structural Uranium Alloys, by G. D. Chandley and D. G. Fleck, Watertown Arsenal, Watertown, Mass. Presented by Mr. Chandley.

Uranium alloys have exceptional density, being about 50 per cent heavier than lead. The gamma phase alloys are best to work with because they are stable at room temperature. The alloys generally are melted in graphite crucibles and poured in grapite molds. Melting and pouring are done under vacuum.

The alloys have poor machinability but excellent tensile properties. Yield strength of 200,000 psi is obtainable in a uranium—8 per cent molybdenum alloy. Application possibilities of uranium alloys are considered good. Chief competitors are tungsten alloys, but these are more expensive and difficult to handle.

Centrifugal Casting of Aluminum-Uranium Alloys, by N. E. Daniel, E. L. Foster, and R. F. Dickerson, Battelle Memorial Institute, Columbus, Ohio. Presented by Mr. Foster.

Procedures for centrifugally casting billets of an aluminum alloy containing 25 to 35 per cent uranium were described. No problems were encountered in air melting the alloy in an induction furnace. The billets were cast at 2500° F in steel molds revolved at 700-900 rpm.

Yields of up to 80 per cent were achieved. Surface appearance and radiographic soundness were good.

A New Type of Light-Weight Cellular Metal, by L. Polonsky, S. Lipson, and H. Markus, Frankford Arsenal, Philadelphia. Presented by Mr. Lipson.

Average density of this new type of cast alloy is about one-third that of the solid alloy. The process involves making a plaster mold and filling the mold cavity with crushed rock salt of four to 100 mesh. Mold and salt are heated prior to pouring to drive off moisture and weld together the salt particles. A molten metal or alloy having a melting point below that of sodium chloride is poured into the mold.

Cooled mold material is broken away from the casting. Any machining required is performed at this point. Then the salt is leached out of the casting in a water bath. Cellular castings have been made with alloys of aluminum, lead, magnesium, tin, and zinc.

Various combinations of cellular and solid material are possible, and a wide variety of applications is foreseen.

"Furnace man—cold metal again!"

Initial Bubble Test for the Determination of Hydrogen Content of Molten Aluminum Alloys, by D. J. Neil and A. C. Burr, Aluminium Laboratories Ltd., Kingston, Ont. Presented by Mr. Neil.

Gas content of aluminum is obtainable in about two minutes with equipment consisting of a heater unit, cover unit, vacuum pump, and an instrument cabinet containing pressure and temperature gages, a vacuum control valve, and the necessary outlets and switches for the vacuum pump and heater.

A molten metal sample is placed in the small heater unit. The vacuum release valve is closed, the vacuum pump switched on, and the needle valve adjusted so that the pressure inside the heater decreases at the rate of 5-10 mm Hg per second.

Because solubility of hydrogen in aluminum alloys is a function of temperature and pressure, hydrogen content can be determined by noting when the first traces of hydrogen precipitate from solution and rise as a bubble to the molten metal surface under a decreasing pressure.

Supercooling Measurements and Grain Size Control in Light Alloys, by V. B. Kurfman, Dow Metal Products Co., a division of Dow Chemical Co., Midland, Mich.

This work relates supercooling values of commercial magnesium and aluminum alloys to control of grain size in the melt. Grain refinement procedures can be governed accordingly.

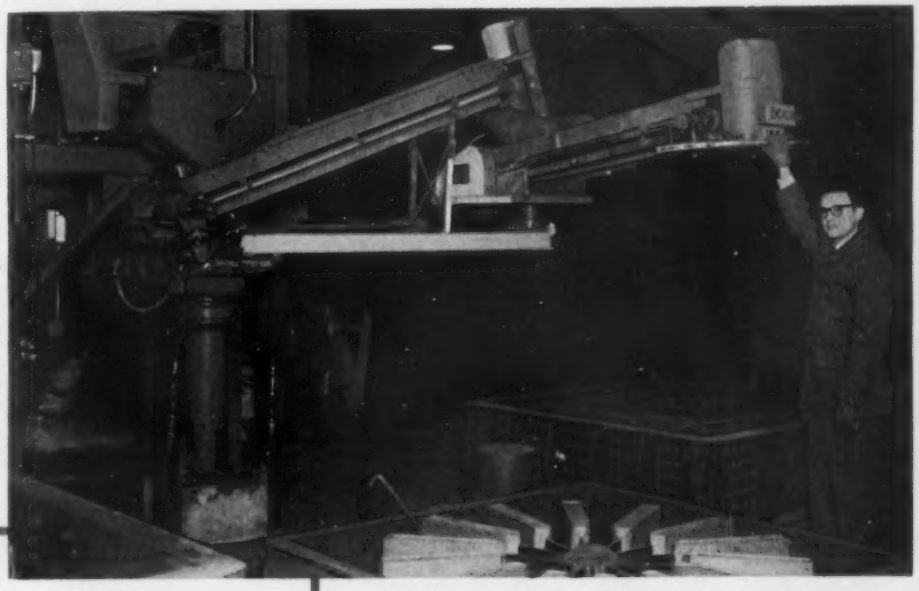
A rapid, open-air cooling curve test is sufficiently sensitive to detect supercooling effect of 1-2 per cent. A complete measurement can be made in less than 2 minutes. Data are presented for Mg-Al, Mg-Zn, Al-Si, Al-Cu, and Al-Mg alloys.

Phosphorus Refinement of Hypereutectic Aluminum-Silicon Casting Alloys, by F. L. Arnold and J. S. Prestley, Reynolds Metals Co., Richmond, Va. Presented by Mr. Arnold.

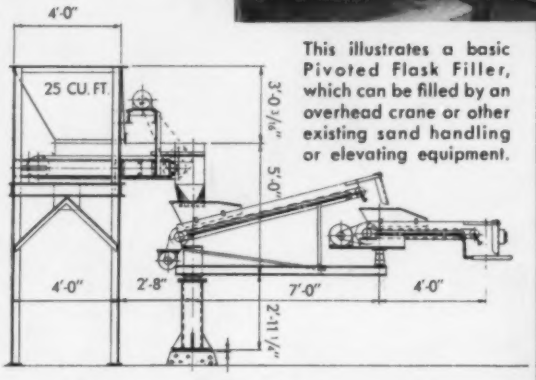
The mechanism by which phosphorus refinement occurs and limitations of that refinement process for an aluminum-16 per cent silicon alloy were studied. Results showed that a high degree of primary silicon refinement can be obtained in permanent mold castings by using

NEWAYGO'S PIVOTING DOUBLE ARM FLASK FILLER

Cuts Large Molds Preparation Time 75%



Double Arm Flask Filler Unit installed in an existing Newaygo Sand Handling System at LEBANON STEEL FOUNDRY CO., Lebanon, Pennsylvania.



This illustrates a basic Pivoted Flask Filler, which can be filled by an overhead crane or other existing sand handling or elevating equipment.

LEBANON reports: "Molds over 60" x 60" are now prepared for the slinger under the flask filler. This consists of facing the pattern with new sand facing, adding about 2 inches of backing sand and ramming into place with air hammers. Gaggers are also added at this point.

"Two common sizes for this operation are 60" x 72" x 42", and 90" x 126" x 48". *We figure conservatively that preparation time on these two sizes and on others in the same range has been cut by 75%.*

"Previously, facing and backing sand was bled off the sand conveyor into wheel barrows or facing sand boxes, which were moved by main bay crane to convenient spots adjacent to the flasks. Sand was then shoveled by hand to prepare the pattern for slinging. Due to the relatively slow method of sand handling we were constantly faced with a congested work area adjacent to the shakeout and slinger.

"The much faster Newaygo Flask Filler Method has virtually eliminated this congestion, resulting in much better use of floor space.

"Having recently (in 1957) installed a Newaygo System, and having lived through the period of change in method, with the normal resistance to change, we were very pleased *two days after we had the Newaygo Flask Filler in operation to have comments from the men as to how much they liked the unit, both from increase in production and the lessened fatigue involved.* We have also found that in removing the facing sand boxes from the operation, we have been able to make better use of the main bay crane."

Complete information and specifications on all Newaygo Foundry Equipment are contained in BULLETIN NO. 56. Send for your free copy.

Mr. Mold Says:

The Newaygo Flask Filler permits using two kinds of sand through the filler by the use of two hoppers, one for facing, and one for backing, — filler capacity up to 50 cu. ft. per minute as needed.

These will help YOU

MOVIE "Progressive Mechanization", featuring HANDY SANDYS in 9 foundries . . . . . MOVIE "Newaygo Pallet Systems for Mold Handling", many types of installations in foundries . . . . Our magazine "SAND SCRIPTS" . . . Bulletins: No. 60 on Pallet Line Systems of Mold Handling . . . . No. 59 on HANDY SANDYS . . . No. 56 on Newaygo Sand and Mold Handling, and Mold Making Equipment.

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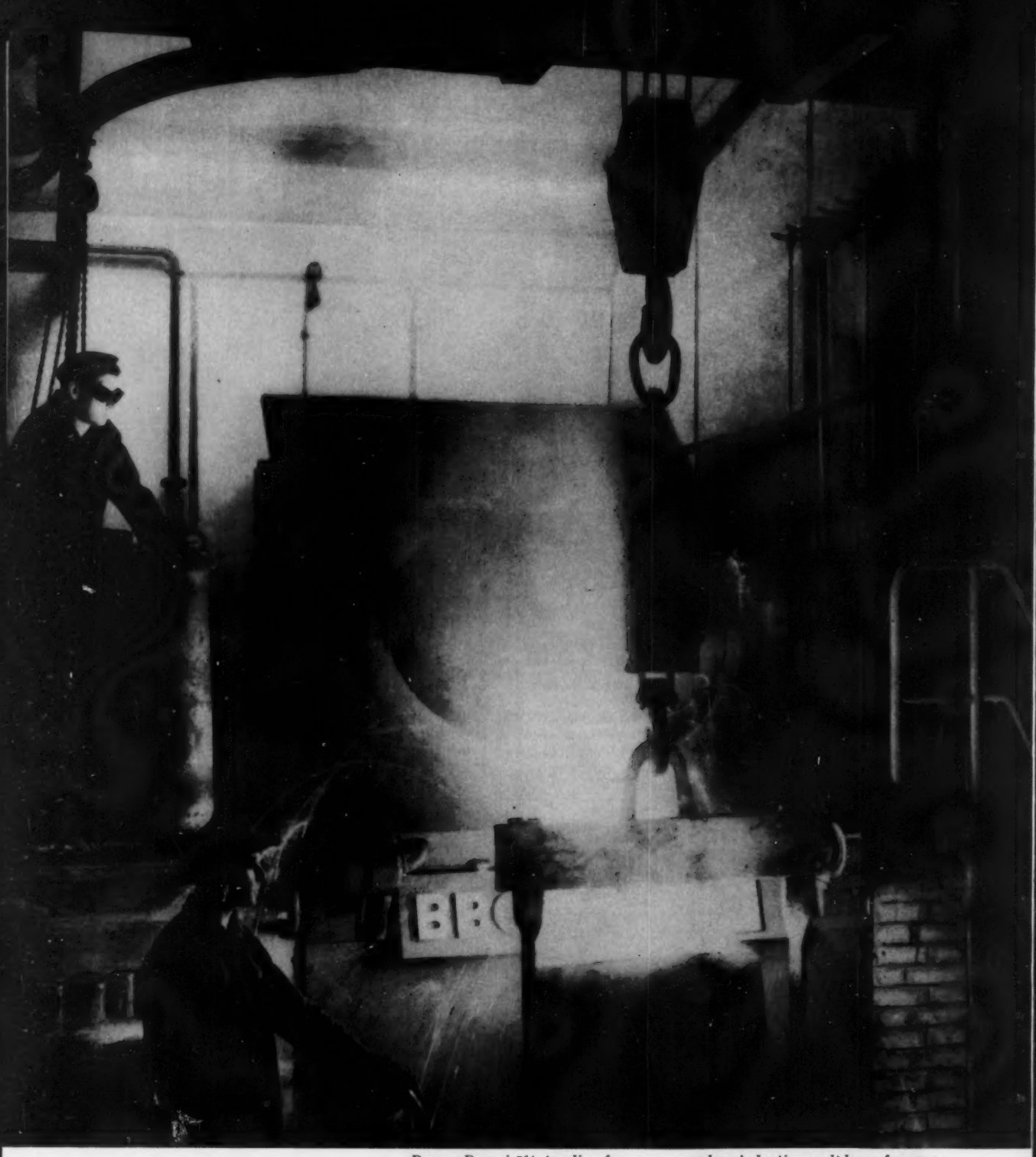


Brown Boveri 5½-ton line-frequency coreless induction meltdown furnace

PREVIEW: FOUNDRY OF THE FUTURE

Early in 1962, in a German plant, *a single operator* at a central console will supervise the "punchcard" operation of an entire gray-iron foundry . . . including charging and meltdown in nine 5½-ton induction furnaces; the automatic alloying, analysis and correction of the melt; and the automated casting strip. The furnaces and automation equipment are now being engineered and built by Brown Boveri.

The furnaces will be Brown Boveri line-frequency coreless induction units similar to that in the photo. Here is why this furnace is rewriting foundry technology:

It produces superior, more uniform metal. It is clean and cool to operate. It is simple, rugged and foolproof, thus ideally suited to automatic control. It is low in cost. (For example: the nine-furnace set-up *including all controls* will cost substantially less than cupola-and-induction furnace duplex equipment.) Sizes up to 18,750 lbs. per hour. And the furnace design has been proved by *hundreds* of installations in the U. S. and throughout the world . . . with a total capacity greater than that of any other manufacturer.

Furnaces for melting, holding, superheating . . . for any metal. Write for application study: Brown Boveri Corp., Dept. F-6, 19 Rector St., N. Y. 6.

BROWN BOVERI

For More Information Circle 641, Page 39

0.40 per cent of a 20 per cent red phosphorus nucleant or 0.02 per cent phosphorus added as 15 per cent phosphorus-copper alloy. Additions of 0.05 to 0.08 per cent phosphorus are required for good refinement in slower cooled green sand castings.

The remelting of phosphorus-treated alloys has no noticeable effect on the degree of refinement until the third or fourth remelting.

Premium Quality Magnesium Sand Castings, by K. E. Nelson, Wellman Bronze & Aluminum Co., Bay City, Mich.

Goal of the test work was to obtain tensile properties in bars cut from castings comparable to properties obtained in separately cast bars. Of the alloys studied, ZK61A-T6, QE22A-T6, and AZ92A exhibited greatest potential for maximum strength castings.

When proper foundry practice in melting, gating, chilling, and heat treatment are used, premium quality castings capable of meeting extremely stringent requirements can be produced.

Progress in High Strength Alloy Castings for Airframes, by W. A. Bailey and E. N. Bossing, Douglas Aircraft Co. Inc., Santa Monica, Calif. Presented by Mr. Bailey.

Because federal specifications covering aluminum alloys did not seem to be adequate, Douglas set up its own standards. Also Douglas found great differences in the properties of identical castings produced of the same alloy in different foundries.

Improvement in the general quality level of castings has come about because of the insistence of customers. Foundries do not take the initiative in making better castings.

Douglas engineers believe that greater improvement can be made in castings by application of well known foundry techniques. Foundries must apply these techniques to make better castings. In the very near future foundries will have to guarantee the quality and performance of castings.

Investment-Cast Properties of Four Magnesium-Base Alloys, by K. Herrick, Arwood Corp., Tilton, N. H.

Investment cast test bars of AZ92A, AZ91C, AZ81A, and AM100A magnesium alloys were tested. Grain size and massive compounds were related to section size and temperatures of the molds and metal at time of pouring. The alloys were classified as to microshrinkage observed in ten typical production castings.

Results show that the four alloys can be investment cast satisfactorily and that tensile properties exceed minimum requirements of government and aeronautical specifications. Tensile properties opproximate those which are obtained by sand casting methods.

Alloy AZ91C had the best combination of mechanical properties and castability for use with the investment casting process.

Five panelists at the Light Metals Division luncheon spoke briefly on the general subject **The Manufacture and Use of Premium Quality Light Alloy Castings as High Integrity Structural Components.**

R. A. Zuech, Rocketdyne Div., North American Aviation Inc., Canoga Park, Calif., stated that reliability is a casting's most important characteristic. Reliability of a cast part is no better than reliability of the foundry process. Any foundry willing to acept and use the results of progress in foundry processes and materials can produce castings with a high reliability standard.

J. H. Rizley, Convair Div., General Dynamics Corp., Pomona, Calif., described the qualification and classification of castings suppliers for the procurement of premium quality castings.

T. E. Piper, Hughes Aircraft Co., Fullerton, Calif., said that 30 per cent of the castings shipped to his company are rejected. Ninety per cent of the defects in the rejected castings are cracks, microshrinkage, shrink porosity, centerline shrink, or hot tears. A great need exists for a basic, scientific study of shrinkage and ways of controlling it.

A. H. Peterson, Lockheed Aircraft Corp., Sunnyvale, Calif., stated that the proper interpretation of requirements for a certain quality level in castings is difficult. Foundryman and buyer must have a clear understanding of each other's interpretation of premium casting quality.

W. A. Bailey, Douglas Aircraft Corp., Santa Monica, Calif., dwelt at some length on the things foundrymen do to try to cover up the poor quality of castings they make. On the other hand, castings buyers often do not need the quality levels they think they need in castings. Both groups have little real confidence in cast parts. Understanding between foundryman and buyer is essential, but of greater importance is an understanding of what the understanding is.

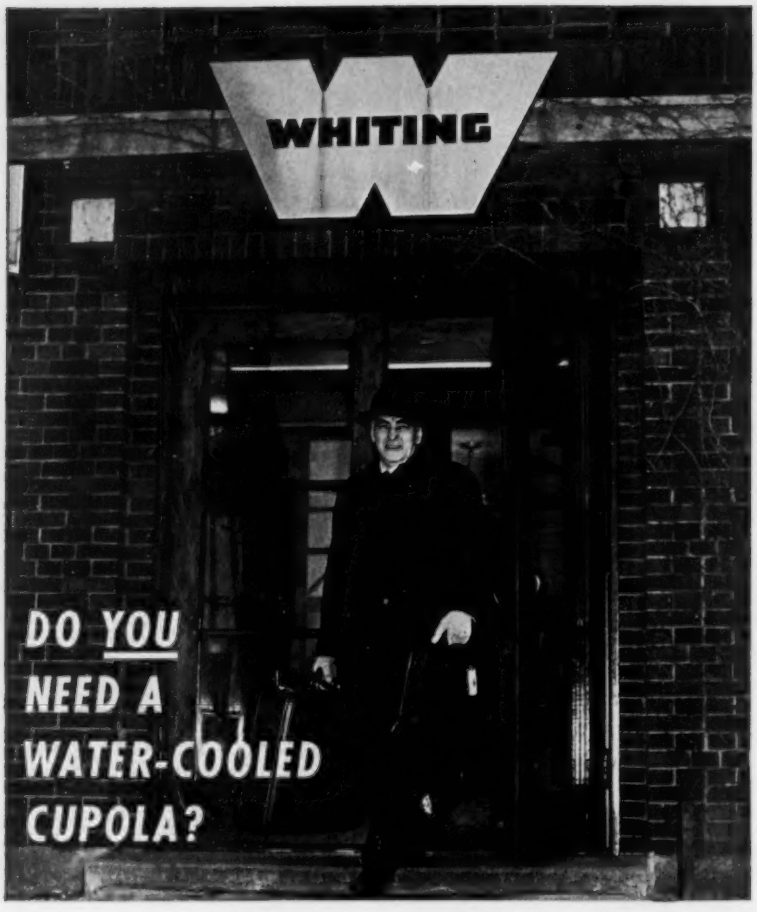
Heat Transfer

● A SESSION on heat transfer considered three papers involving heat transfer conditions and the report of the AFS Committee on Heat Transfer.

Factors Affecting Casting Soundness in Certain Alloys with Long and Short Freezing Ranges, by J. T. Berry and T. Watmough, Armour Research Foundation, Chicago, was presented by Mr. Berry. A study of sand bonded with bentonite, with silicate, and with cement showed that the last provided the most rigid mold, an important factor in producing sound castings. In some tests using a rigid mold with a plaster sleeve to form the sprue and gate, admittance of argon gas under a pressure of 20 psi on the metal was found to reduce porosity and shrinkage on certain long freezing range alloys.

Thermal Properties of Mold Materials, by M. R. Sheshadri and A. Ramachandran, Indian Institute of Science, Bangalore, India, was presented by R. W. Ruddle, Foseco Inc., Cleveland. Investigation of the chilling powers of the mold materials—sand, magnesite, and silicon carbide bonded with bentonite and with sodium silicate—indicated that silicon carbide bonded with silicate had the highest chilling power. The carbide bonded with bentonite was next in order, followed by magnesite bonded with silicate.

How Much of Your Superheat Is Being Lost in the Runner? by J. W. Hlinka, V. Paschkis, and F. S. Puhr, Columbia University, New York, was presented by Dr. Paschkis. Previous studies on solidification rates of metal in mold cavities were based on metal temperatures at the entrance into the sprue. This method is not accurate, however, since cer-



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Walter R. Jaeschke (Jas'ke) is a Whiting consulting metallurgical engineer and an international consultant on foundry cupola problems. His recommendations have slashed melting costs in Europe, South America, South Africa and Japan, as well as for scores of U.S. firms. An authority on water-cooled cupolas, he consulted extensively on the world's largest—built by Whiting for Acme Steel.

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FOUNDRY EQUIPMENT

tain temperature losses occur in the gating system. Investigation led to development of formulas and charts to determine what the percentage of temperature loss will be with any metal or alloy and gating system. Application of the formulas will permit more accurate data on solidification rates.

Heat Transfer Committee Report by W. K. Bock, National Malleable & Steel Castings Co., Cleveland, was presented by R. C. Shnay, Canada Iron Foundries Ltd., Toronto, Ont. The committee is preparing a bibliography on the subject of heat transfer, and is developing a motion picture on solidification. The project to determine heat loss in the runner system has been concluded, the results being presented in the foregoing paper by Hlinka, Paschkis, and Puhr.

(*Concluding Reports Next Month*)

Book Review

***Systematic Layout Planning*, by Richard Muther, 350 pages, published by Industrial Education Institute, 221 Columbus Ave., Boston 16, Mass. Price $9.50.**

Book gives step-by-step procedures for the supervisor, manager, or engineer to follow when planning a profitable and efficient layout. A universal pattern is explained which can be applied to solving any plant layout problem, including small improvements, overall changes in existing facilities, and planning new buildings. Examples are worked out to demonstrate the techniques involved, and a complete duplicate set of blank work forms is included.

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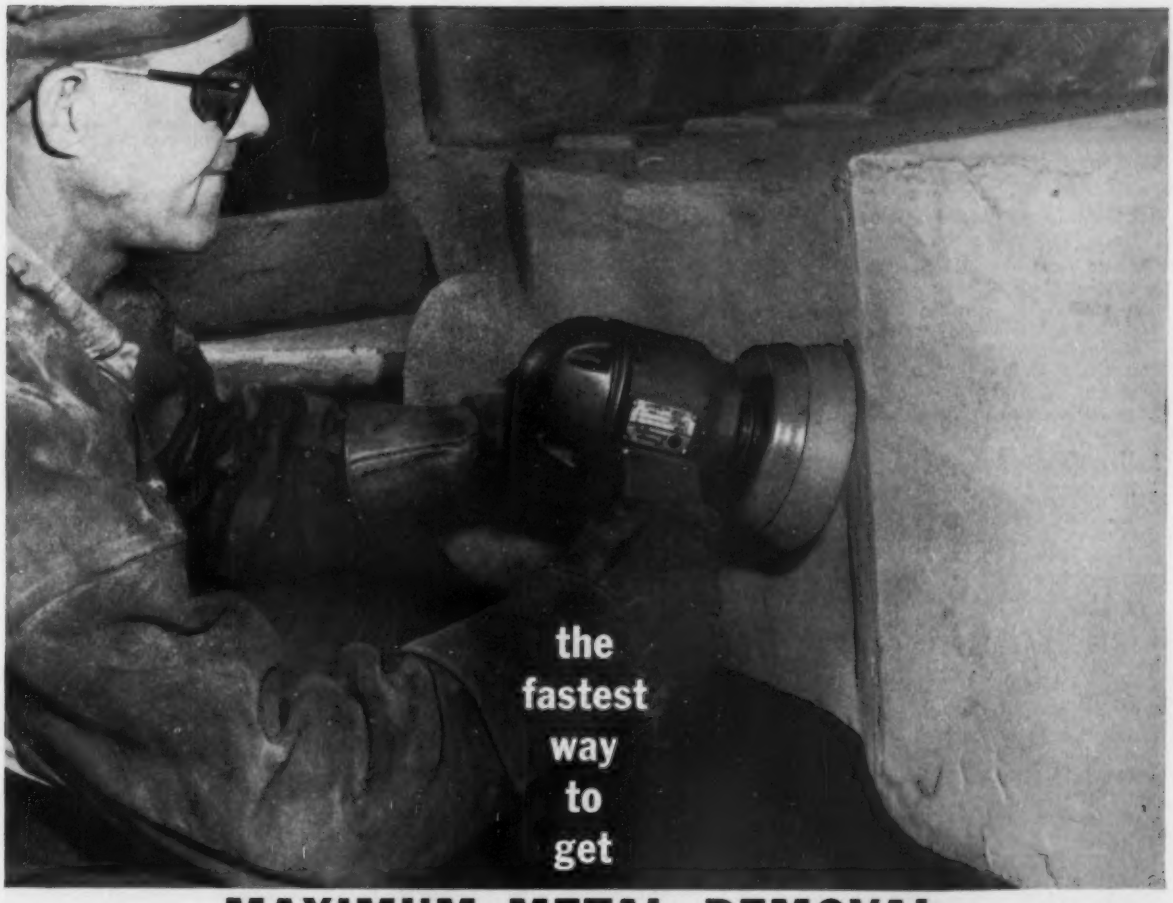

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For More Information Circle 643, Page 39

LITERATURE for Foundrymen

Shell Mold and Core Resins

Bulletin describes five major classes of phenolic resins for making shell molds and cores, including powder, alcohol soluble powdered, alcohol solution, waterborne, and coarse crushed or flaked types. —**Union Carbide Plastics Co.**, division of Union Carbide Corp., 270 Park Ave., New York 17, N. Y.

For More Details Circle No. 408—Page 39

Roller Hearth Furnace

Bulletin GED-4304 includes descriptions, diagrams, and charts covering company's line of gas or electric roller hearth furnaces for annealing, hardening, brazing, sintering, and general heat treating. —**General Electric Co.**, Schenectady 5, N. Y.

For More Details Circle No. 409—Page 39

Gunning Mixes

Bulletin No. 38 describes gunning mixes for repairing open hearths, electric furnaces, and similar installations.—**H. K. Porter Co.**, Refractories Div., Porter Bldg., Pittsburgh 19, Pa.

For More Details Circle No. 410—Page 39

Lifting Magnets

Bulletin 112B contains specifications for several types of lifting magnets. Typical nomenclature and construction procedures are explained also.—**Ohio Electric Mfg. Co.**, Maple Heights, Ohio.

For More Details Circle No. 411—Page 39

Platform Scale

Catalog No. 161 provides complete information on a mobile platform scale which can be mounted and used on fork lift trucks.—**Hydroway Scales Inc.**, P. O. Box 531, Oakridge Station, Royal Oak, Mich.

For More Details Circle No. 412—Page 39

Jib Cranes

Bulletin C-102 includes complete specifications for several types of jib cranes.—**H. L. Bushman Co.**, 100 W. Central Ave., Roselle, Ill.

For More Details Circle No. 413—Page 39

Diecasting Plunger Rings

Diecasting plunger rings of butt cut gap and step cut gap types are illustrated in four-page folder. — **Precision Piston Rings Inc.**, 1417-1423 Commerce Ave., Indianapolis 1, Ind.

For More Details Circle No. 414—Page 39

Riser Sleeves

Brochure entitled "How to Determine Feedex Riser Sleeve Sizes for Steel Castings" lists steps necessary to compute riser sizes for economy and for maximum feeding efficiency. It also explains how to analyze basic casting shapes for proper risering and how to estimate the number of risers required.—**Foseco Inc.**, P. O. Box 8728, Cleveland, Ohio.

For More Details Circle No. 415—Page 39

Spectrochemical Power Source

Brochure SV-12-60 describes the compact Spectro-Varisource, designed to provide sufficient power for most spectrochemical applications.—**Jarrel-Ash Co.**, 26 Farwell St., Newtonville 60, Mass.

For More Details Circle No. 416—Page 39

Die Release Agents

Data sheets describe die release agents for large, intricate castings and for aluminum die and permanent mold castings.—**E. F. Houghton & Co.**, 303 W. Lehigh Ave., Philadelphia 33, Pa.

For More Details Circle No. 417—Page 39

Processing Equipment

Catalog A-661 shows the range of finishing and processing equipment and systems that the company engineers, fabricates, and installs.—**R. C. Mahon Co.**, P. O. Box 4666, Detroit 34, Mich.

For More Details Circle No. 418—Page 39

Atmospheric Burners

Fourteen-page illustrated Bulletin H-1 provides engineering data, ordering information, and a description of the operating principle for eight atmospheric gas-fired burners with capacities up to 2¾ million Btu per hr.—**Combustion Div., Eclipse Fuel Engineering Co.**, Rockford, Ill.

For More Details Circle No. 419—Page 39

Did You Miss These?

Here is a list of popular literature items offered in recent months:

OPTICAL PYROMETER (Data Sheet ND42-35)—Leeds & Northrup Co., Philadelphia 44, Pa. Circle 402, Page 39.

DEOXIDIZER—Brown Aluminum & Chemical Co., Cleveland 25, Ohio. Circle 403, Page 39.

INDUCTION HEATING—Induction Heating Corp., Brooklyn 11, N. Y. Circle 404, Page 39.

SHELL MOLD BONDING RESIN ("For the Foundry Industry")—Schenectady Varnish Co. Circle 405, Page 39.

TECHNICAL FILMS—Modern Talking Picture Service, New York 22, N. Y. Circle 406, Page 39.

ALUMINUM ALLOY (Brochure 103R5)—Federated Metals Div., American Smelting & Refining Co., 120 Broadway, New York 5, N. Y. Circle 407, Page 39.

Spectrophotometer

Bulletin 724D describes the IR-5A infrared spectrophotometer, a low-cost automatic recording instrument featuring both single and double-beam operation.—**Technical Information Dept., Beckman Scientific & Process Instruments Div.**, Fullerton, Calif.

For More Details Circle No. 420—Page 39

Mounted Wheels

Catalog of 30 pages contains general information, operating recommendations, and product descriptions for a complete line of mounted grinding wheels.—**Bay State Abrasive Products Co.**, Westboro, Mass.

For More Details Circle No. 421—Page 39

Molten Metal Pumps

Folders describe pumps for molten aluminum and zinc which utilize air pressure to power the impeller which draws metal from the bath to the spout.—**Metal Pumping Services Inc.**, Box 3991, Cleveland 20, Ohio.

For More Details Circle No. 422—Page 39

High Temperature Mortar

Bulletin 602 describes air-setting mortar for high-temperature applications with firebrick such as high alumina, superduty, high-duty or low-duty brick.—**J. H. France Refractories Co.**, 10960 France Rd., Snow Shoe, Pa.

For More Details Circle No. 423—Page 39

Metal Treating Agents

Four-page brochure lists and describes the properties of covering and cleaning fluxes, degassers, deoxidants, exothermics, and other compounds for treating copper and nickel alloys.—**Foseco Inc.**, P. O. Box 8728, Cleveland 35, Ohio.

For More Details Circle No. 424—Page 39

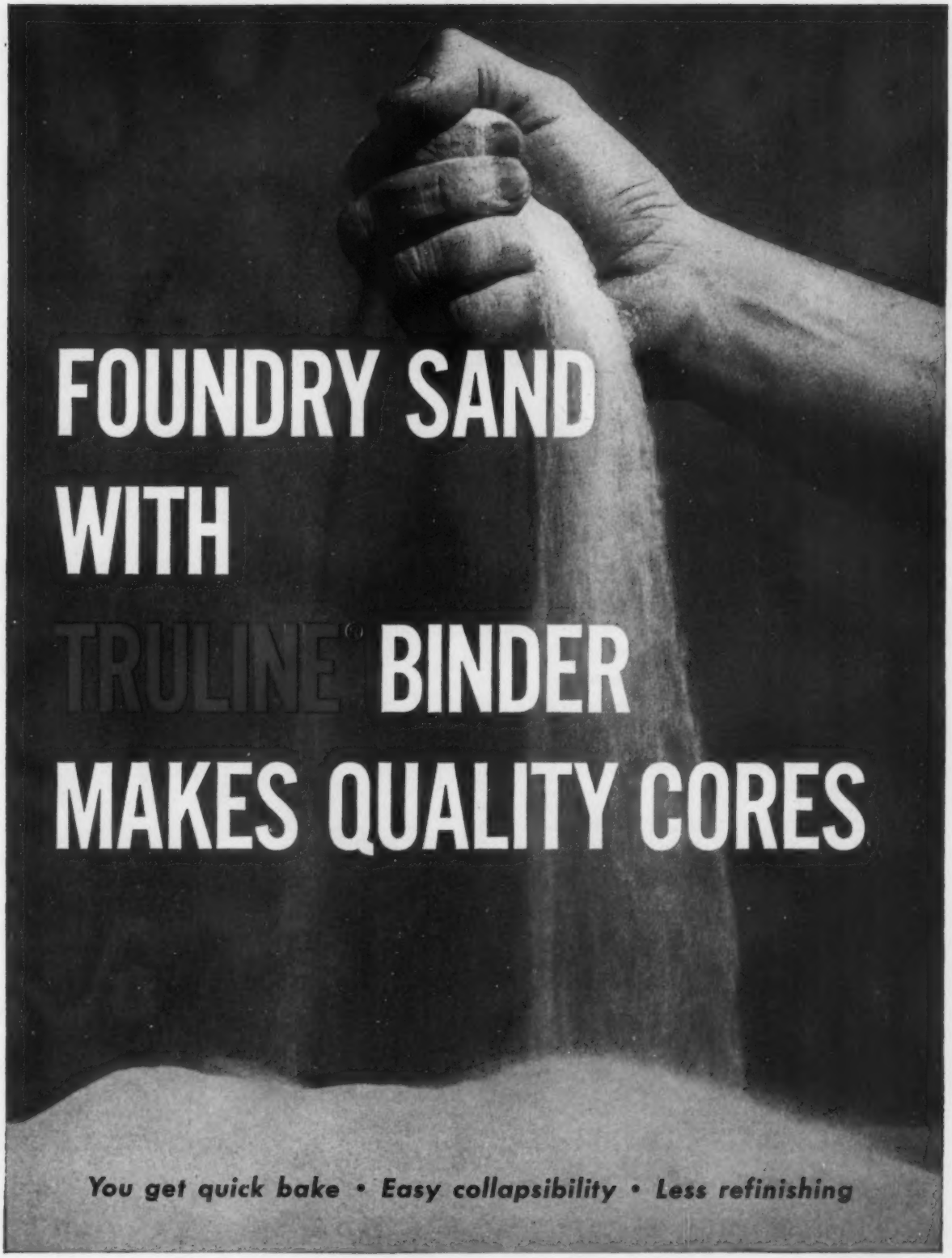
Wire Baskets

Eight-page Bulletin B-10 describes and illustrates line of woven wire baskets for heat treating, processing, or transporting castings.—**Newark Wire Cloth Co.**, 351 Verona Ave., Newark 4, N. J.

For More Details Circle No. 425—Page 39

Aluminum-Zinc Alloy

Brochure lists characteristics and capabilities of self-aging aluminum-zinc prime alloy 613. Information provided covers



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Midvale Mining and Manufacturing Co., St. Louis, Missouri
Carl F. Miller and Company, Inc. Seattle, Washington
John P. Moninger, Elmwood Park, Illinois
Pennsylvania Foundry Supply & Sand Co., Philadelphia, Pennsylvania
Robbins and Bohr, Chattanooga, Tennessee
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For More Information Circle 645, Page 39

composition, physical and mechanical properties, government specifications, and suggested foundry practices.—Kaiser Aluminum & Chemical Sales Inc., Dept. SA-847, 300 Lakeside Dr., Oakland 12, Calif.
For More Details Circle No. 426—Page 39

Narrow Aisle Trucks

Sixteen-page booklet describes a complete line of narrow-aisle electric trucks and hydraulic hand pallet trucks. In-

formation on a variety of applications is provided, also.—Raymond Corp., 65-187 Madison St., Greene, N. Y.
For More Details Circle No. 427—Page 39

Electric Tools

High-frequency electric tools such as grinders, sanders, impact wrenches, and drills are featured in Catalog 62. The 32-page publication also describes the advantages of 180, 360, or 400-cycle tools for specific job applications.—Thor Power Tool Co., 175 N. State St., Aurora, Ill.
For More Details Circle No. 428—Page 39

Positioners

Bulletin 500A features positioners for regulating tools, valves, doors, hoppers, etc. Many illustrations, line drawings, and charts are provided.—Hanna Engineering Works, Dept. PR-27, 1765 Elston Ave., Chicago 22, Ill.
For More Details Circle No. 429—Page 39

Foundry Conveyors

Bulletin CS-161 describes portable and permanent conveyors for foundry applications. Accessories also are described.—C & S Products Co., 18656 Fitzpatrick, Detroit 28, Mich.
For More Details Circle No. 430—Page 39

Grouting

Bulletin EPMG-2a describes company's grouting mixture and explains preferred grouting methods and techniques.—Master Builders Co., Cleveland 18, Ohio.
For More Details Circle No. 431—Page 39

Scrap Breaker

Folder covers two scrap breaker models for breaking rail scrap, cast iron up to 6 in. thick, or other scrap.—Select Enterprises Inc., Wilmington, Ohio.
For More Details Circle No. 432—Page 39

Management Course

Booklet describes correspondence course entitled "Profitable Management for Small Business." Publication outlines what the course will cover, the procedures involved, and the cost.—Dun & Bradstreet Inc., Business Education Div., Box 283, Murray Hill Station, New York 16, N. Y.
For More Details Circle No. 433—Page 39

Spray Washer

Two-page brochure describes unit for spray washing parts before heat treating, after quenching, or after subsequent processing.—Waukee Engineering Co., 5138 N. 35th St., Milwaukee 9, Wis.
For More Details Circle No. 434—Page 39

Welding Equipment

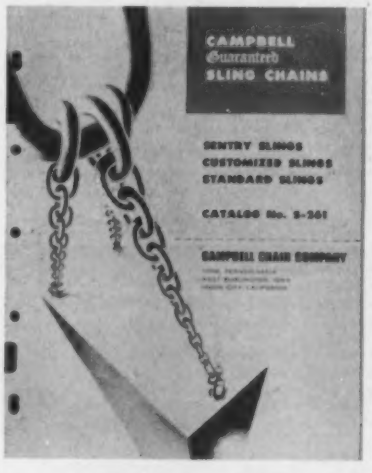
Brochures EW-211, EW-209, DM-144, and DM-134 illustrate and describe welding equipment and accessories. Booklets include dimensions, applications, and advantages of these products.—Hobart Bros. Co., 1221 Hobart Rd., Troy, Ohio.
For More Details Circle No. 435—Page 39

Controllers

Catalog C-15-2a, with 56 pages, covers complete line of strip chart controllers, circular chart controllers, and circular scale indicating controllers featuring a new modular design.—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Avenues, Philadelphia 44, Pa.
For More Details Circle No. 436—Page 39

Sling Chains

Catalog of 20 pages features special alloy, wrought iron, and steel sling chains.



Complete descriptions, tables of specifications, and a glossary of chain terms and industry coding symbols are presented.—Campbell Chain Co., York, Pa.
For More Details Circle No. 437—Page 39

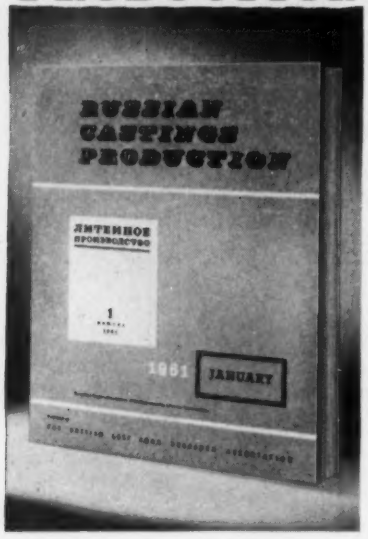
Electric Hoists

Eight-page brochure presents construction features and engineering data on several models of electric hoists.—Euclid Crane & Hoist Co., 1365 Chardon Rd., Cleveland 17, Ohio.
For More Details Circle No. 438—Page 39

Alloy Injection Process

Pamphlet explains Petrocarb process for

SPOTLIGHT ON RUSSIAN CASTINGS PRODUCTION



Cover to cover translation of Liteinoe Proizvodstvo.

Liteinoe Proizvodstvo is the leading Russian periodical devoted to the foundry industry. It deals with all aspects of iron, steel and non-ferrous castings production in Russia, from raw materials to finished products, including their behavior. As a service to the foundry industry on both sides of the Atlantic, the British Cast Iron Research Association is publishing a cover to cover translation of this important journal each month. If you wish to keep up to date on current Russian practice—and their fresh approach to day-to-day problems, new techniques and metallurgical investigations are of interest to every go-ahead foundryman—a year's subscription is a worthwhile investment.

FEATURED ARTICLES

- **A precision casting foundry**
- **Scrap reduction**
- **High-capacity cupola blowers**
- **Gating systems for pressure die-castings**
- **Cupola operation with natural gas partly replacing coke**
- **Non-metallic inclusions in malleable iron**
- **Stresses due to the strength of cores**
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For More Information Circle 646, Page 39

recarburizing, desulfurizing, deoxidizing, alloying, and inoculating molten iron and steel. Equipment, treating agents, and applications are described.—Petrocarb Inc., 100 Church St., New York 7, N. Y.

For More Details Circle No. 439—Page 39

Air Pollution Control

Pamphlet entitled "Together We Can Check the Blight of Air Pollution" discusses a plan for effective air pollution control by industry and government. A bibliography is included.—John Wood Co., Air Pollution Control Div., Florham Park, N. J.

For More Details Circle No. 440—Page 39

Core Binder

Pocket-sized booklet tells how company's product can be used to advantage as a core binder and facing flour in gray iron, steel, malleable, and nonferrous practice.—Knefler-Bates Co., Indianapolis, Ind..

For More Details Circle No. 441—Page 39

Material Handling Containers

Four-page Brochure S-61 contains specifications, features, and construction details on various types of steel mesh containers for material handling, storage, and transport.—Union Steel Products Co., Albion, Mich.

For More Details Circle No. 442—Page 39

Telephone Booths

Four-page folder describes line of open-construction, acoustical telephone booths for installation in noisy locations.—Burgess-Manning Co., 749 E. Park Ave., Libertyville, Ill.

For More Details Circle No. 443—Page 39

Die Design Service

Literature describes company's die design service. Additional information is provided on company's experience, facilities, and the other services offered.—John Erler Industries Inc., 4 E. Laskey Rd., Toledo 12, Ohio.

For More Details Circle No. 444—Page 39

Air Hose Fittings

Bulletin IEB-53 covers various categories of end fittings used for low, medium, and high-pressure hose assemblies in addition to hose assemblies of Teflon with special fittings.—Aeroquip Corp., Jackson, Mich.

For More Details Circle No. 445—Page 39

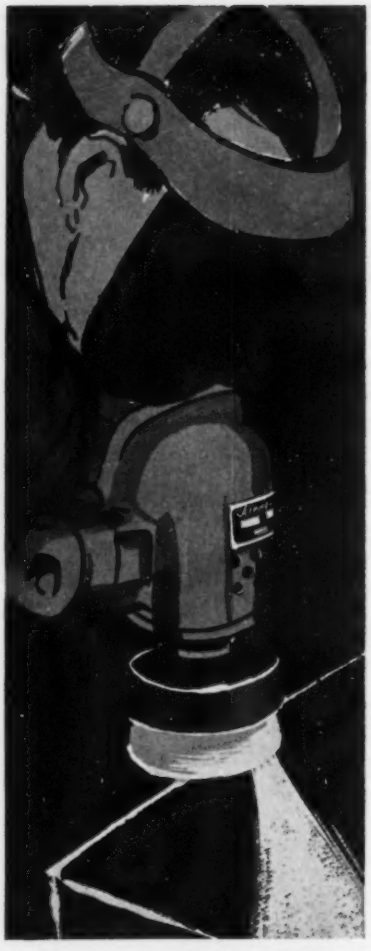
Thermal Insulation

Thermal insulation for all types of industrial requirements, including insulating firebrick and refractories, are described in a 64-page catalog, No. IN-244A.—Johns-Manville Sales Corp., 22 E. 40th St., New York 16, N. Y.

For More Details Circle No. 446—Page 39

Cupola Charger

Bulletin 2300 is a leaflet covering the features of the Cupoloader, a cupola charger of rectangular design with a vi-



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For More Information Circle 647, Page 39

brating feeder.—Brown Metals Inc., subsidiary of Brown Fintube Co., 300 Huron St., Elyria, Ohio.

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Information Service

Brochure outlines information searching service for finding specific metallurgical information printed in the world's current technical literature, patents, and government reports.—American Society for Metals, Metals Park, Novelty, Ohio.

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Errors in Where-to-Buy

Listing of the Shalco Div., National Acme Co., 173 E. 131st St., Cleveland 8, Ohio, inadvertently was omitted from the Where-To-Buy section published in the May issue of FOUNDRY. That section classifies the foundry equipment, materials, and services offered to the industry by advertisers in the magazine.

Shalco Div., National Acme Co., should have been listed under the following headings:

Blowplates (Core and Mold); Core Blowing and Shooting Machines; Coreboxes; Coremaking Machines; Installation (Foundry Equipment); Molding Machines (Shell Mold); Nozzles (Blasting, Spray); Release Agents; Sand (Resin Coated); Sand Preparation Equipment; Spray Guns; Timers (Electric); Vents (Core); Vents (Corebox).

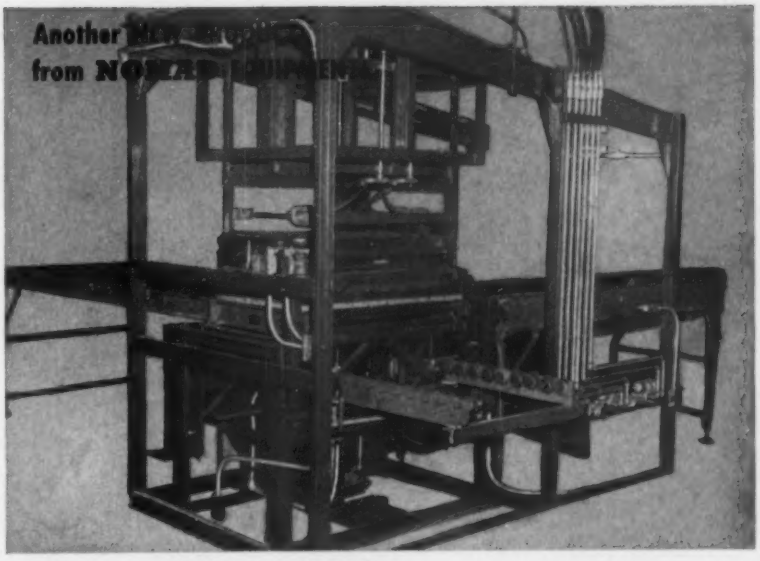
We also regret that the listings under the headings of both Refractories and Riddles were not arranged properly. The listings should be as follows:

REFRACTORIES (Firebrick, Fire Clay, Fire Sand, Fire Stone)

Ajax Magnethermic Corp.
3990 Simon Rd., Youngstown 1, Ohio.
Allentown Pneumatic Gun Co.
1520 Walnut St., Allentown, Pa.
Archer-Daniels-Midland Co., Federal Foundry Supply Div.
2191 W. 110th St., Cleveland 2, Ohio.
Babcock & Wilcox Co.
161 42nd St., New York 17, N. Y.
Campbell-Hausfeld Co., Harrison, Ohio.
Carborundum Co., Perth Amboy, N. J.
Carpenter Bros., Inc.
606 West Wisconsin, Milwaukee 3, Wis.
Cedar Heights Clay Co., Oak Hill, Ohio.
Denver Fire Clay Co.
2301 Blake St., Denver 2, Colo.
Eastern Clay Products Dept., International Minerals & Chemical Corp.
Old Orchard Rd., Skokie, Ill.
Great Lakes Carbon Co.
18 E. 48th St., New York 17, N. Y.
A. P. Green Fire Brick Co., Mexico, Mo.
Harbison-Walker Refractories Co.
307 Fifth Ave., Pittsburgh 22, Pa.
Hickman Williams & Co.
Union Commerce Bldg., Cleveland 14, Ohio.
Kaiser Refractories & Chemical Div.
300 Lakeside Drive, Oakland 12, Calif.
Inductotherm Corp.
412 Illinois Ave., Delanco, N. J.
Ironton Fire Brick Co., Ironton, Ohio.
Johns-Manville
22 East 40th St., New York 16, N. Y.
Lindberg Engineering Co., Fisher Furnace Div.
2450 W. Hubbard, Chicago 12, Ill.
National Carbon Co., Div., Union Carbide Corp.
30 East 42nd St., New York 17, N. Y.
North American Refractories Co.
East 6th National City Bank Bldg.
Cleveland 14, Ohio.
Norton Co., Worcester 6, Mass.
Frederic B. Stevens, Inc.
18th St. & Vernor Highway, Detroit 16, Mich.
Chas. Taylor Sons Co.
710 Burns St., Cincinnati 4, Ohio.
United States Graphite Co., Saginaw, Mich.
Whitehead Bros. Co.
324 W. 23rd St., New York 11, N. Y.

RIDDLES (Hand)

Archer-Daniels-Midland Co., Federal Foundry Supply Div.
2191 W. 110th St., Cleveland 2, Ohio.
Great Western Mfg. Co., Leavenworth, Kans.
Frederic B. Stevens, Inc.
18th St. & Vernor Highway, Detroit 16, Mich.
Whitehead Metals Inc.
303 W. 10th St., New York 14, N. Y.



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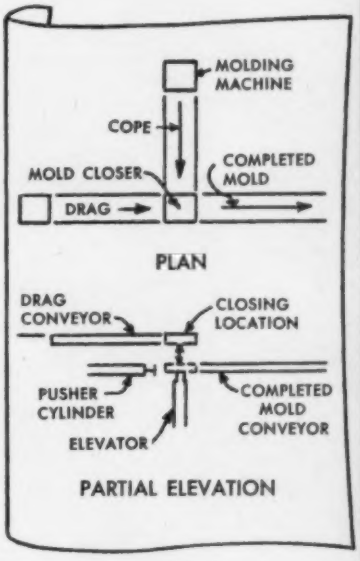

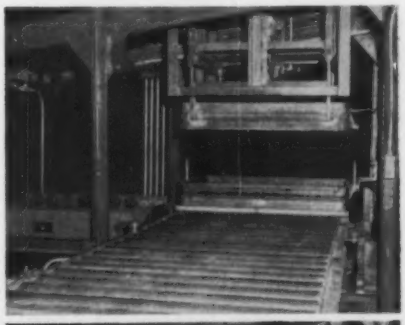

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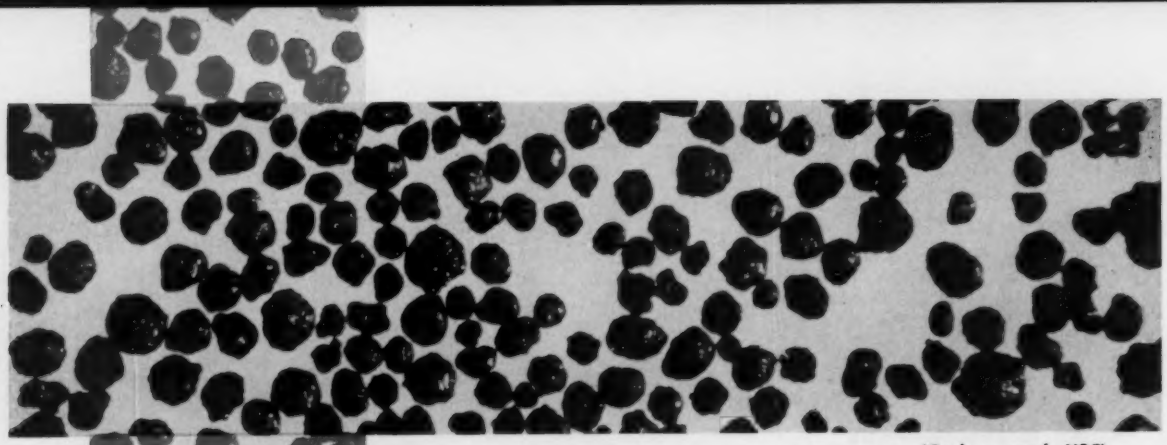

(Carbon sand, X25)

CARBON SAND

Minimizes Penetration

By ANGELO PAOLI
Foundry Superintendent
Central Iron Foundry Co.
Detroit

● A NEW molding material has practically eliminated penetration and sand expansion defects on heavy gray iron castings at Central Iron Foundry Co., Detroit. Central produces automotive body dies and machine tool castings which weigh up to 40 tons and have metal sections up to 18 in.

The molding material used in severe penetration areas is a grain-shaped composition of high carbon content best described as "carbon sand." This material consists of hard, solid, round-grain carbon particles. It is not a pulverized material.

Casting of body dies requires special procedures for many reasons. Patterns are made of plain pine and are constructed as economically as possible since only one casting per pattern usually is required. No draft or fillets are provided, and deep pockets, sharp angles, and heavy wall sections are common. Susceptibility to penetration and scabbing are inherent in this type of casting.

Accurate Dimensions — To provide dimensional accuracy with a minimum of finishing, Central uses unusual methods to produce clean, sound castings. Flat areas generally are faced with slab cores, backed with slinger sand. Air-setting sand is used where contours prevent use of slab cores. Copes are green sand rammed by slinger, and all mold and core surfaces are blackened and dried. The deep pockets, pin cores, and tool relief areas are made of carbon sand to prevent penetration of castings.

This round-grain carbon sand, made by Humble Oil & Refining Co., is a product of a petroleum refinery unit known as a fluid coker. The product is further calcined at 2500° F to remove all volatile hydrocarbons and to yield a hard, round-grain carbon of excellent thermal stability. A typical screen analysis is shown in Table I.

TABLE I—Typical Screen Analysis of Round-Grain Carbon Sand

U. S. Sieve No.	Per Cent Retained
20	1.2
30	0.6
40	1.9
50	9.6
70	25.9
100	32.3
140	19.6
200	7.4
270	1.1
Pan	0.3
	100.0
AFS Fineness No.	73.3

Source: Humble Oil & Refining Co.

Although carbon sand can be used as a synthetic mold facing, its principal application at Central Iron Foundry is in problem cores, as mentioned previously. Two carbon sand mixes are in regular use and are given in Table II. Cores are hand rammed and baked with other cores of all sizes for 8 hours at 380° F. They are blackened while either hot or cold and are torched dry. Baking times are adjusted arbitrarily to suit largest cores.

The core mixtures shown are used according to severity of casting conditions. Mix No. 1 does the job in nearly all cases, but Mix No. 2 is needed occasionally to produce clean sharp castings. Prior to the use of carbon sand with silica sand, as in Mix No. 1, these problem cores were made with zircon sand, with no silica sand added.

Weight Is Light — Carbon sand weighs considerably less than regular sand—only 9 lb per gallon compared with 12 lb for silica and 23 lb for zircon. This difference in bulking value must be considered in setting up core mixtures. Thus 100 lb of carbon sand is equal in

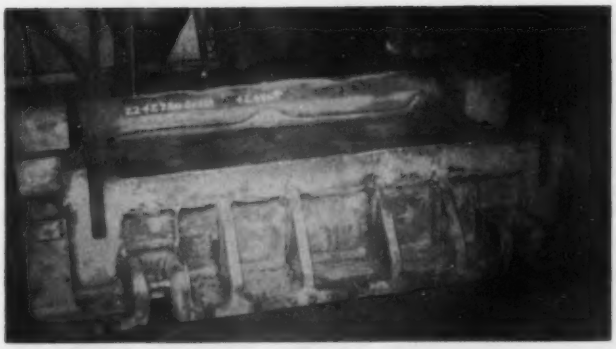

Fig. 1—Carbon sand cores were used for the corner slots on this automotive die. Drag side is showing

Fig. 2—Close-up of slots in Fig. 1. The die weighs 21½ tons and forms station wagon roofs

TABLE II—Carbon Sand Core Mixtures

	Mix No. 1	Mix No. 2
Carbon sand	100 lb	200 lb
Silica sand	100 lb	.....
Cereal binder	5 lb	8 lb
Water	6 qt	8 qt
Core oil	7 lb	8 lb

Mixing cycle (high-speed mixer): 30 seconds dry, 30 seconds water, 30 seconds oil. Baked tensile: 275 psi. Scratch hardness: 90.

volume to approximately 133 lb of silica sand or 255 lb of zircon sand.

Carbon sand is subject to soft hand ramming due to its light weight, but it can and should be rammed hard to insure the smoothest possible casting surface. Any penetration invariably can be traced to soft ramming. The mixtures are clean working and slick nicely. Shakeout and peel are excellent.

The elimination of casting defects on surfaces cored with carbon

TABLE III—Thermal Expansion, Carbon Sand and Silica Sand, Equal Volumes

	Carbon Sand	Silica Sand
Carbon sand (grams)	2850	....
Silica sand (grams)	....	3800
Western bentonite (grams)	200	200
Water (cubic centimeters)	104	104
Green compression (psi)	8.3	6.4
Green deformation (in./in.)	0.0208	0.0187
Hardness (1⅛ x 2-in. specimen)	88	86
Hollow-confined expansion at 1500° F, in./in.	0.0034	0.0290

Source: Humble Oil & Refining Co.

sand is believed due to these properties of the material: 1. Thermal expansion of carbon sand is approximately one-eighth that of silica sand. 2. Carbon sand has no sintering point, does not react with molten iron, and is not wetted by molten metal. 3. Carbon sand shows a faster rate of heat transfer than silica sand and therefore hastens skinning and cooling of castings.

Fig. 3—This pin core for heavy metal thickness is a typical application of carbon sand at Central Iron Foundry

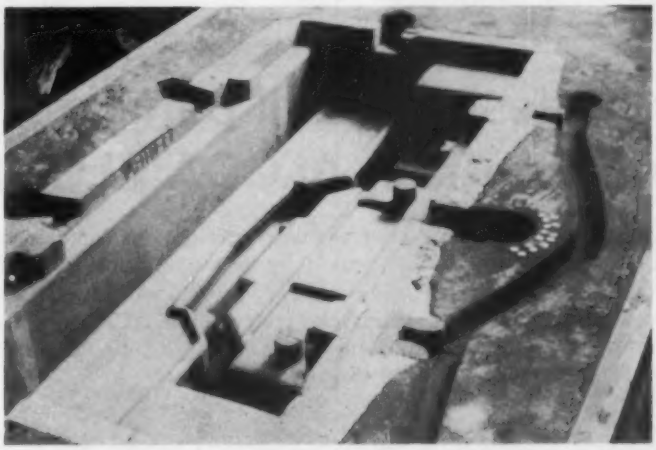

Fig. 4—The long core in the center is another application of carbon sand. It is used to prevent penetration

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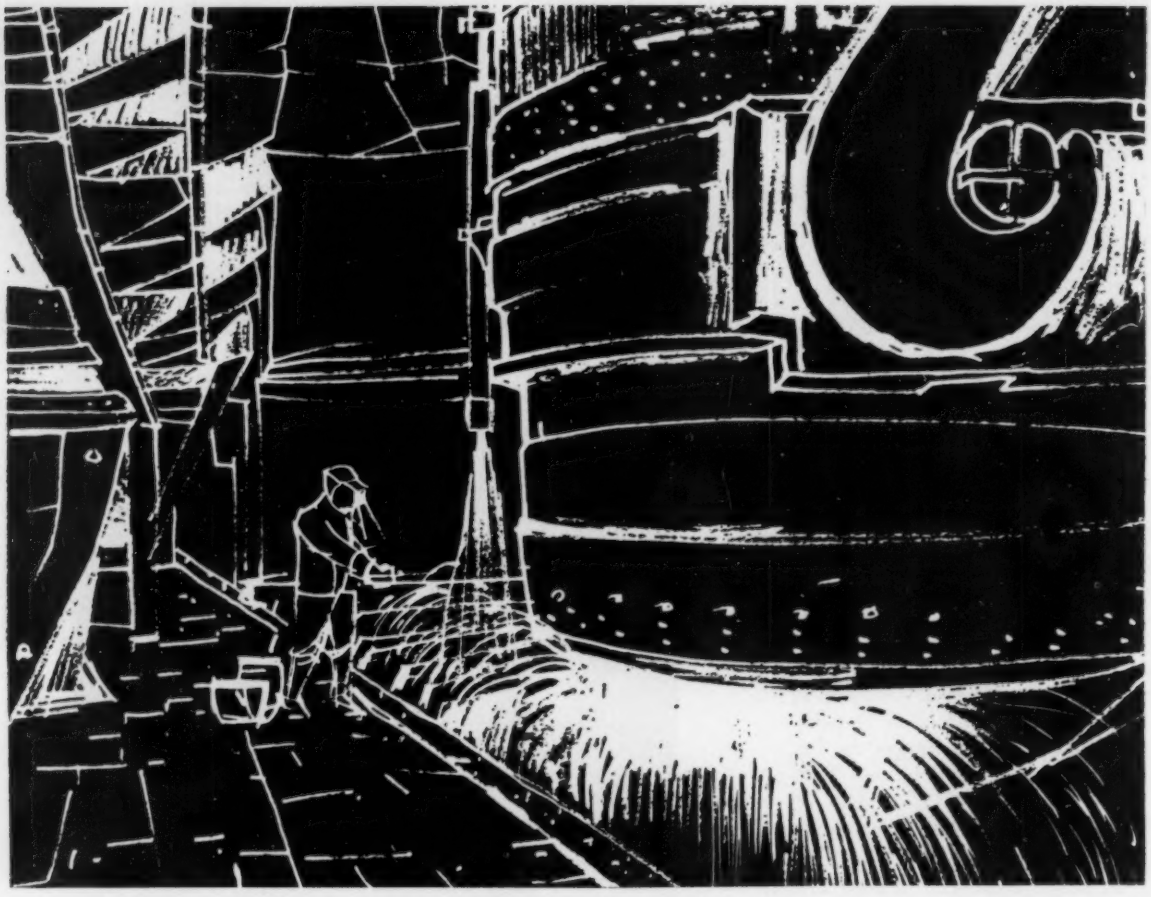

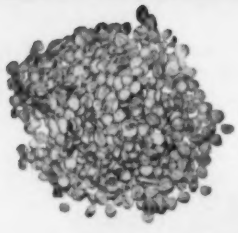

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ALCOA ALUMINUM

INGOT

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Pours Vacuum Degassed Steel under Argon

CHICAGO—About two years ago, A. Finkl & Sons Co., Chicago, manufacturer of die blocks and heavy forgings, announced a new method of vacuum degassing molten steel in the ladle. Adaptable to steel foundry practice, the process (see FOUNDRY, Oct. 1959, page 30) removes hydrogen gas as well as other unwanted oxygen and nitrogen to make the steel cleaner, tougher, and more ductile.

Now the Finkl company has worked out two refinements. One is a method for puting additives into the molten steel while the ladle is under a high vacuum inside the degassing chamber and the other is a method for pouring vacuum degassed steel through a blanket of argon gas and into ingot molds filled with argon. Both of these refinements, which were demonstrated to the press on May 4, also hold interesting possibilities for steel foundries.

Introducing the additives into the steel while the ladle is under vacuum has been accomplished by installing an air-tight hopper in the top of the large vacuum degassing chamber. Limestone, aluminum, and other additives are placed in the hopper before the degassing process starts, sealed tight and then released during the process.

The addition of these materials at the proper time in the cycle of making electric furnace steel is said to contribute to improving the quality of the steel and serves as an insulating cover over the molten steel during the pouring period.

Pouring of degassed steel through a blanket of argon gas and into argon-filled ingot molds keeps oxygen in the air from reaching the molten metal. This is done by attaching a steel collar about 15 inches in diameter around the pouring outlet in the bottom of the ladle holding 75,000 pounds of steel. Attached to this collar is a feeding hose from tanks of compressed argon.

The ladle then is lowered to the hot-topped ingot mold which has previously been filled and sealed with argon gas. The gas is turned on, filling the collar with the inert gas, then the stopper rod is opened and the steel poured through the blanket of gas.

The argon pouring procedure, which practically excludes gas pick-up by the pouring stream, was devised by Linde Co. However, a number of the original process details have been changed to Finkl's specific requirements.

Argon pouring already is being employed by some foundries in production of high quality steel and alloy castings. The technique here described requires molds made from materials which will seal the gas in the mold cavities. Green sand molds would allow the gas to diffuse away.

"Fill it up, Buster . . . . an' ya' might get the windshield for a change."

Prospects for June not Bright

PITTSBURGH — First-quarter operations of local foundries paralleled those of a major customer, the steel industry, and were sharply disappointing. Several firms report that their shipments were 25 to 30 per cent below the fourth quarter's. Bookings picked up moderately in March, accelerated in April, but fell off again in early May—just when foundrymen were beginning to think they were out of the woods. As FOUNDRY went to press, prospects for June were not bright.

After a strong April, a leading gray iron foundry saw inquiries dip

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sharply. "We don't know what to make of it," a company spokesman declared. "Maybe it's just a lull before another upturn. We're pouring three to four heats a week and working four to five days. We can live on the work we're getting, but we'll have a pretty lean diet."

April bookings of one nonferrous foundry went against the trend, dropping 15 per cent below those of March. As its backlog dwindled, the firm had to curtail its operations from five days a week to three days. Higher prices of ingot metal put a squeeze on profits because it couldn't pass the increased costs on to customers without giving them several weeks notice.

Suppliers to railroad car builders complain that their business is terrible. The railroads have curtailed maintenance to a minimum and have only 4000 new cars on order—the smallest total in years. A major supplier of railroad castings had a strong fourth quarter because many of its customers hedged against a price increase that was to become effective on Jan. 1. "We lived on borrowed prosperity," a sales executive asserts. "Our first-quarter bookings dropped about 30 per cent. We're still working five days a week, but only by putting a lot of our production into inventory. To keep our operations up, we're having to take jobs at prices that won't cover our overhead."

April sales of rolling mill rolls reflected the steel industry's conviction that May would be a month of higher production. One roll-maker reported a 35 per cent gain in shipments (vs. the previous month) and a 25 per cent jump in bookings. Another firm said its April bookings were up about 5 per cent. Both agreed that May started slowly—apparently because steelmakers were doubtful whether they could keep operating at the May level through June.

East Coast Situation Spotty

PHILADELPHIA—Despite more favorable seasonal conditions, foundry business hasn't cut loose by any stretch of the imagination. Here and there some improvement is noted, but over-all the situation definitely is spotty.

In gray iron, auto die work hasn't come through as anticipated, pipe

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demand is slow, and textile machinery requirements lag. Gear drive business is steady but at a low level. There is some pickup, however, in demand for castings for papermaking machinery and construction needs.

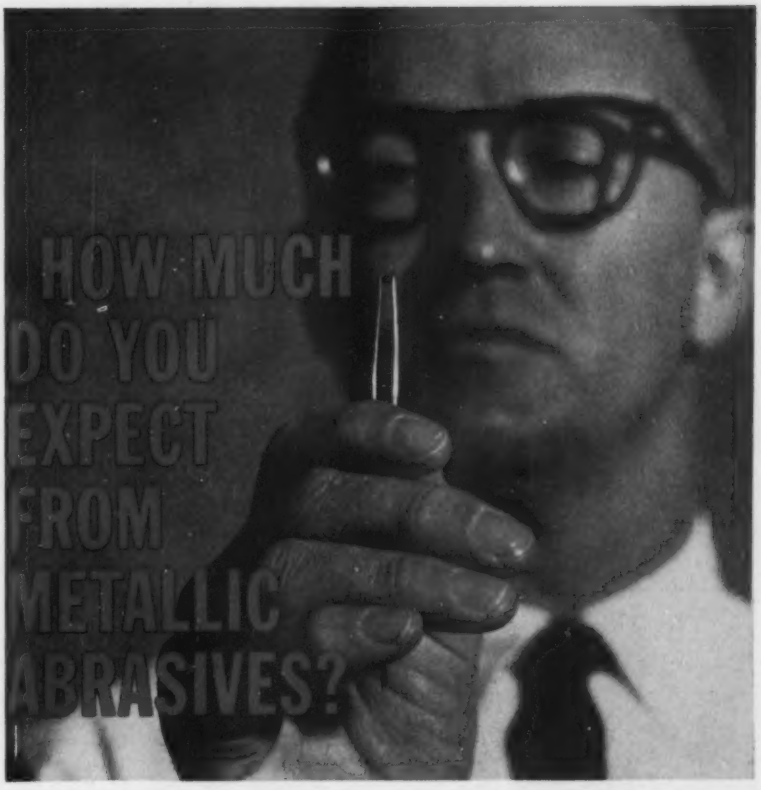
In the immediate area, gray iron job shops are estimated to be averaging around 60-65 per cent (nearer the inside figure) on the basis of normal capacity for a single shift. In April this average dropped below 60 per cent and was down slightly from March. In northern New Jersey and around New York City, the bottom appears to have dropped out of the market, according to some jobbers. Heavy floor work is virtually nil. Certain gray iron shops are pouring only two days a week, although molding schedules are a little more extended.

In the eastern Pennsylvania area two gray iron job shops have gone out of business. One is the M & M Foundry Co., Hamburg, Pa. (owned by the Morrison Machine Co., Paterson, N. J.), and the other the Deery Foundry Co., Philadelphia. As noted in the May issue, the Eastern Co., Naugatuck, Conn., has closed its malleable foundry in Wilington, Del.

Steel Demand a Shade Better

Steel casting demand is perhaps a shade better, but the lag in heavy industrial equipment still is pronounced. Operations, it is estimated, average around 65 per cent of capacity on a single turn basis. Delivery promises range five to six weeks. Malleable reflects some improvement in demand for building hardware, electrical transmission work, and small boat components. Business in pipe fittings shows little change and railroad needs lag badly. Some shops have worked back to a five-day week schedule, but with light forces.

Some brass and bronze captive shops report a gain in valves, pumps, and meters. Over-all, however, and taking into account independent shops, red metal casting producers report little improvement. Buying still is hand-to-mouth and production is well below normal for this season of the year. Ship work has provided little help to date. Aluminum casting producers note some pickup in missile launching requirements.



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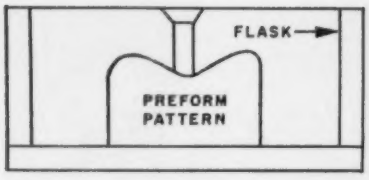
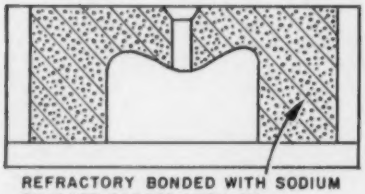
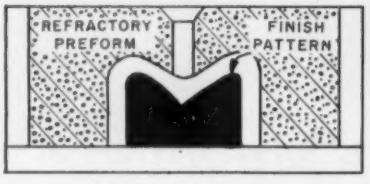
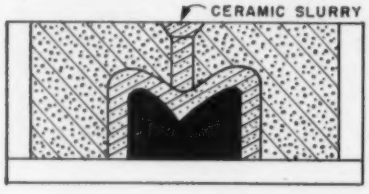
COMPOSITE MOLDS

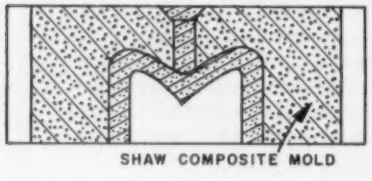
Developed for Shaw Process

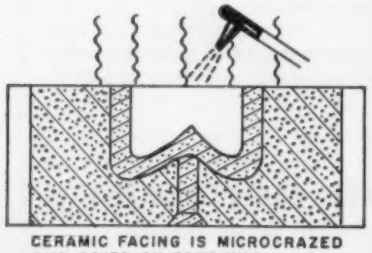












● DEVELOPMENT of a composite mold is expected to bring the cost of Shaw Process molding into the mass production range. According to Shaw Process Development Corp., Port Washington, N. Y., the new method substitutes reclaimable ceramic facing and backup materials for the solid ceramic mold commonly used.

The reason for the low cost of the new composite mold is that the main body of the mold, 95 per cent by volume, is made of an inexpensive granular refractory material. The balance is a facing of special ceramic slurry. This mold structure is said to offer all the inherent characteristics of the solid ceramic Shaw mold at a substantial saving in material cost. An additional saving results from reclaiming the mold material.

Making Composite Molds — A preform pattern and a finish pattern are needed to make composite molds, Fig. 1. Cope and drag preforms are made 3/32 in. oversize on all mold cavity surfaces to allow for the thickness of the ceramic facing.

Tops and bottoms of the cope and drag flasks are Blanchard-ground, as are the flask ears. To assure alignment at each stage of mold production, alignment holes are drilled and reamed to a jig. As a further safeguard, a sand strip is cast into the insides of the flasks to keep the hardened preforms from shifting during handling.

Preform patterns are mounted on a pin lift molding table. Flasks are aligned by dowel pins and alignment holes on the table before they are fastened to the patterns by quick-acting clamps.

The refractory mix for preforms is prepared from medium invert sugar with 68 per cent solids, sodium silicate, and reclaimed fine and coarse refractory material. The invert sugar dilutes the CO_2 without the harmful effects usually encountered with water; it also aids breakup of the mold.

The refractory mix is rammed around a preform pattern, Fig. 2. The rammed half mold is placed in a bell jar for 10-20 seconds and hardened with commercial grade CO_2 at 35 psi. While gassing the first preform, the operator rams the second flask with the composite mix. By this time the first preform is hardened and is removed from the bell jar. The operator repeats the gassing procedure for the second preform.

The gassed preform mold halves are stripped from the preform patterns. Each hardened preform mold half is aligned with the final pattern bolted to the molding table. The flasks are fastened to the patterns by quick-acting clamps, Fig. 3.

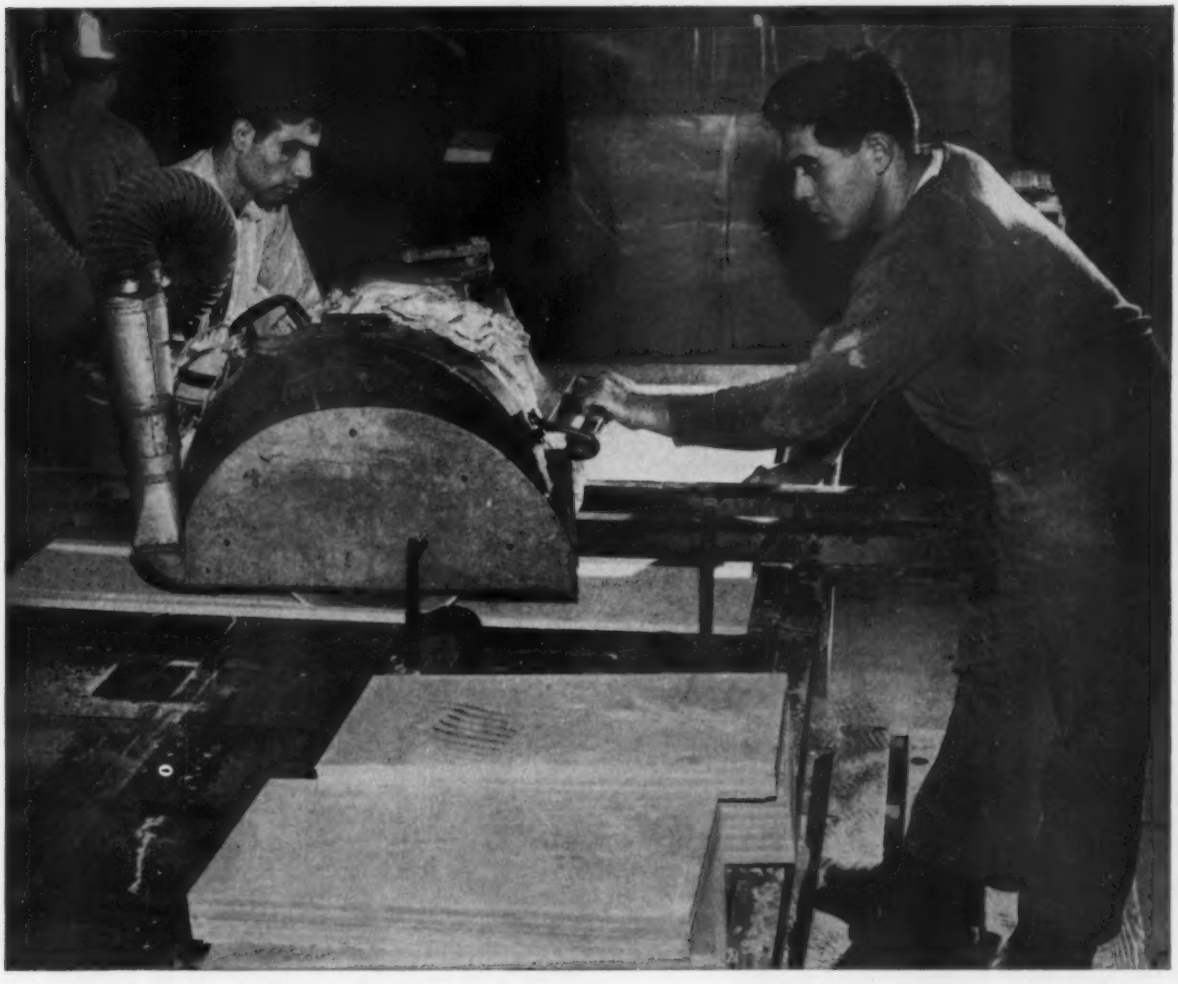
Slurry Forms Facing—The Shaw ceramic slurry needed for the facing of the composite mold is virtually the same as used for the solid body mold — a specially-blended formula of refractory powders, ethyl silicate-base binder, and a gelling agent.

The thick, creamy slurry is poured into the gap between the final pattern and hardened backing. The slurry not only fills all details of the mold cavity, but penetrates the interstices of the surface of the porous backing, creating a strong, mechanical bond.

Gelling of the slurry requires 2-3 minutes, and the fine ceramic facing of the composite mold is formed. The composite cope and drag are then unclamped and lifted off the patterns by a foot-operated stripping plate, Fig. 4.

The molds are placed on a roller

◀ **Fig. 1—Simplified step-by-step diagrams show how the new Shaw Process composite mold casting technique works. Two molding materials are used**



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Johns-Manville Research Engineers have now developed a new light-weight Transite Core Plate sheet stock which makes it possible for this sturdy asbestos-cement board to be cut locally by an authorized J-M cutter-rehandler and shipped to you promptly without further factory processing.

This quick service eliminates the danger of costly production delays due to slow deliveries. And the lighter weight means lower freight costs, too.

Transite Core Plates have proved themselves in hundreds of ferrous and non-ferrous foundries all over the country. Extremely strong, they resist shock and corrosion, will not crack or break under normal use. They maintain their smooth, level surface year after year with a minimum of wear.

FREE FOLDER GIVES COMPLETE DETAILS

Whether or not you now use Transite Core Plates, there are many rewards to be had from a careful study of J-M folder IN-219A. It gives complete specifications on weights, sizes and thicknesses. And, for the address of your local authorized J-M cutter-rehandler, write Johns-Manville, Box 14, New York 16, New York. In Canada: Johns-Manville, Ltd., Port Credit, Ontario. Cable address: Johnmanvil.

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For More Information Circle 654, Page 39

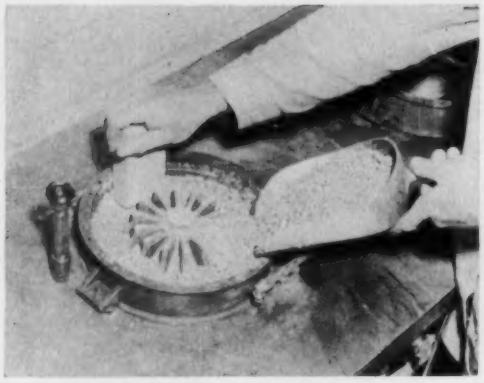


Fig. 2—Refractory mix is rammed around preform pattern and hardened by CO_2 gassing

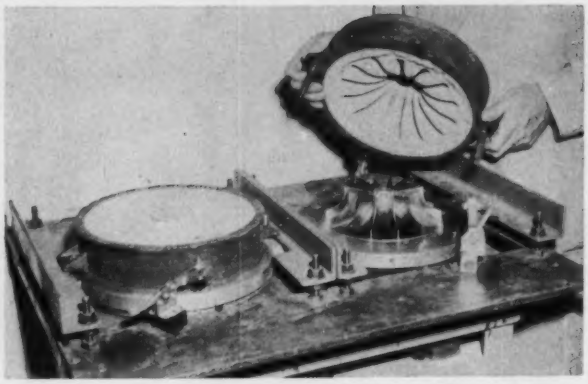


Fig. 3—Gas-hardened preform is set over final pattern and secured by quick-acting clamps

Fig. 4 — Composite cope and drag are unclamped and lifted off patterns by stripping plate

conveyor for movement through a torching zone where the volatiles are ignited and consumed. It is during this burn-off period that the microcrazed structure of the Shaw mold occurs. The cope and drag molds then are moved directly into a high-pressure torching zone for 5-10 minutes where the molds are brought to incandescence.

Copes and drags are assembled, alignment pins assuring accuracy, Fig. 5. The mold can be assembled either hot or cold, whichever is more convenient to the production schedule. Clamping the flasks together is said to assure an accurate match between cope and drag and to reduce flash and thickness variations across the parting line.

In the casting operation, the metal is poured directly down the riser as rapidly as possible. When cooled, the riser is hit with an air hammer, resulting in complete removal of the backing material. Some of the ceramic facing material clings to the casting and can be removed by sand blasting.

Zircon sand is used for blast cleaning the castings and subsequently becomes part of the mold material in the reclamation process. Used mold material is crushed in a cement mixer as shown in Fig. 6 and screened to classify it for reuse. Coarser material is used as backup; the fines can be employed in the facing slurry.

Automatic Machine—Shaw Process Development Corp. currently is building an automatic molding machine for producing composite molds. The machine employs upper and lower levels of wheeled conveyors about 18 ft long on which pattern plates are indexed through the machine 30 in. each 15 seconds. Mold halves are made on the upper conveyor. The facing slurry is allowed to gel at the last six stations on the upper conveyor before an elevator lowers each pattern plate and half mold to the bottom conveyor where hardening of the facing takes place and molds are stripped from the patterns.

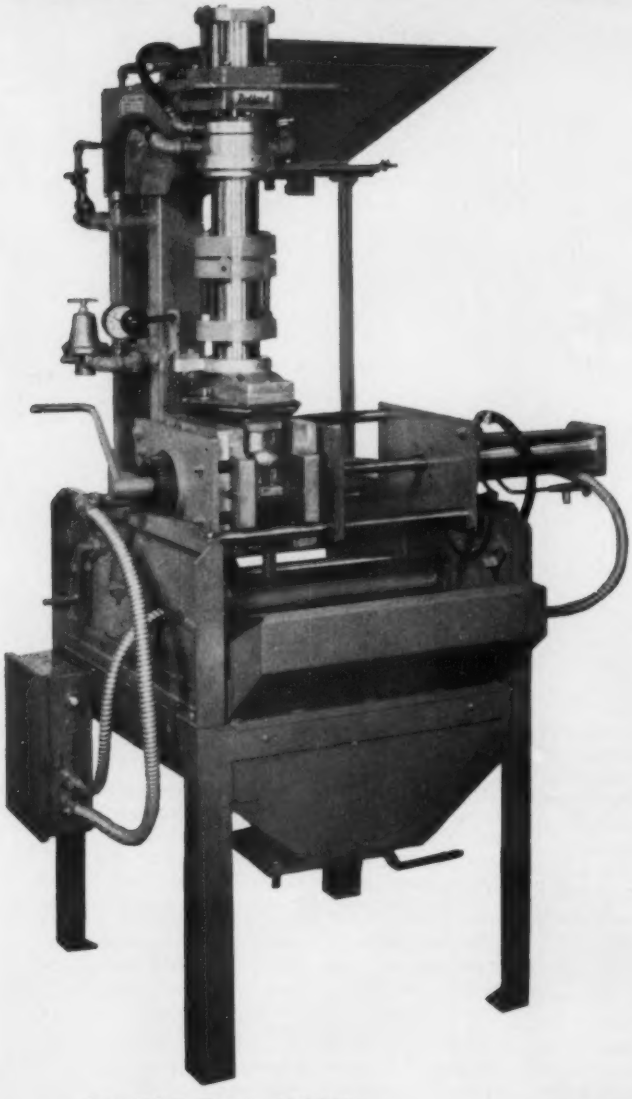
Flasks are placed over the pre-

Fig. 5—After torching, the molds are closed either hot or cold. Pins assure accuracy

Fig. 6—Backing and facing are reclaimed by crushing to provide reusable backing

Redford

MODEL HP-4
SHELL CORE BLOWER



A very fast low cost machine that is setting new standards in the production of small shell cores. The quality of intricate shell cores is improved because sand is blown into core box cavities through unrestricted blow holes. A novel cradle-type core box clamp is used to invert the core box and at the same time bring the core box within easy reach of the operator for core removal. There is no out of balance weight to struggle with. The machine can handle core boxes up to 10" x 10" in size. Shell cores may weigh up to 4 lbs., before draining.

The HP-4 Redford has ample blow capacity and can also be used to blow Furfural resin sand mixes into heated core boxes.

Price F.O.B. Detroit—$1,200.00
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. . Above cores illustrate the variety of work that can be done with the Redford HP-4 Core Blower.

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20733 Glendale - Detroit 23, Mich.
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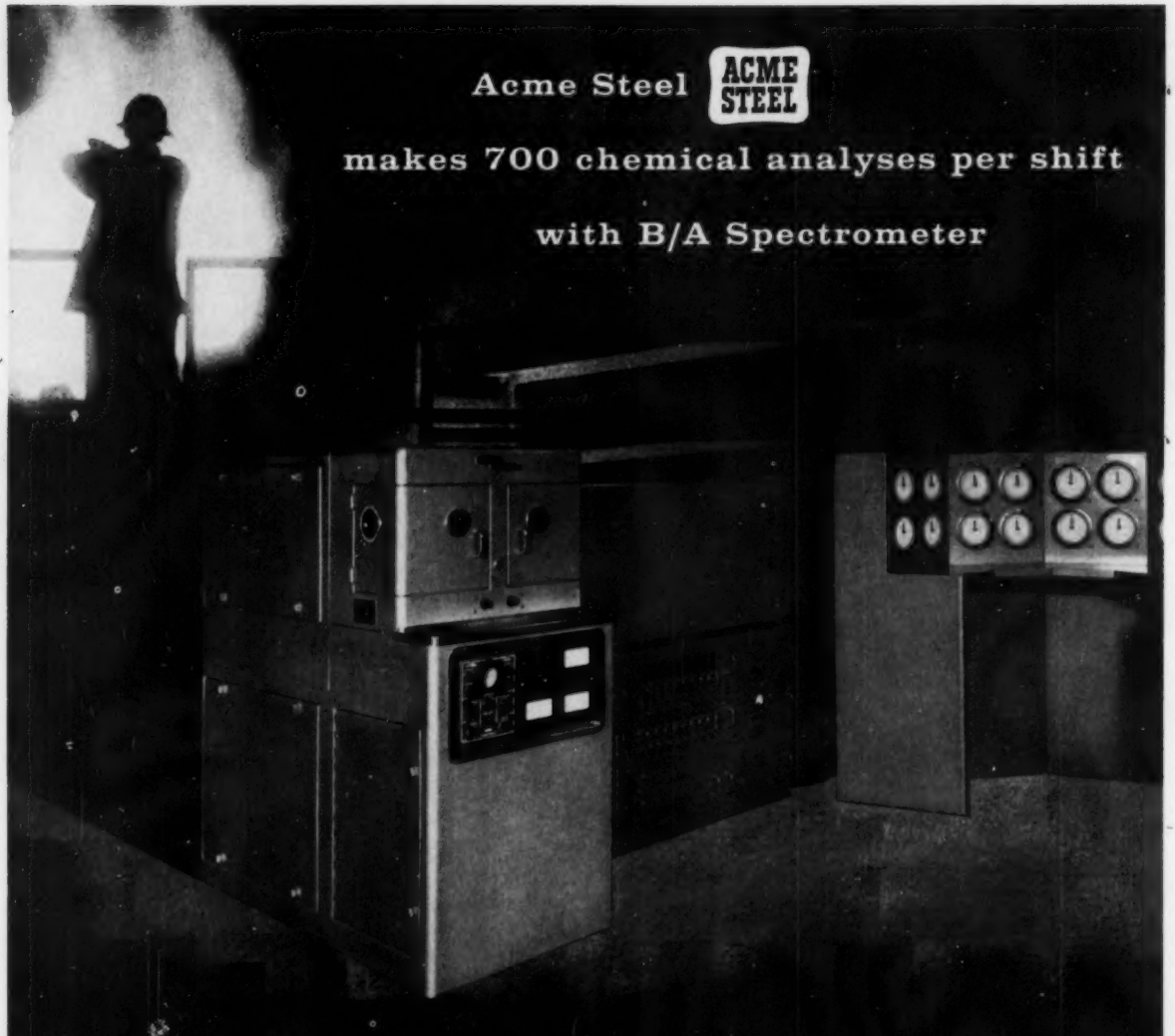

Acme Steel ACME STEEL makes 700 chemical analyses per shift with B/A Spectrometer

At Acme Steel Company, Riverdale, Illinois, a new oxygen converter makes possible highly specialized production and a forty-four-minute tap-to-tap. This high speed steelmaking method demands analysis of nine melt samples an hour—16 hours a day—seven days a week. That's why Acme relies on a Baird-Atomic Direct-Reading Spectrometer to supply quick, accurate analyses of each heat.

With just one B/A Direct-Reader, combined with carbon and sulfur analytical equipment, one Acme operator can make a complete analysis of steel (ten elements) or slag (six elements) and report back to the melt shop — in six minutes flat.

This reliable combination of: Steel by Acme-Spectroscopy by Baird-Atomic has proved itself over 10,000 steelmaking hours and more than ¾ million determinations with no standby wet-lab in the event of equipment failure.

This same rigid quality control and time-saving convenience can be yours with a B/A Direct-Reading Spectrometer. Write today for information.

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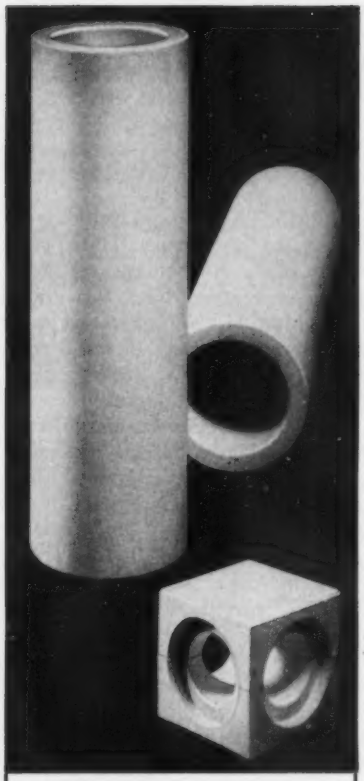

Louthan gate tiles cut foundry costs

You minimize casting problems, get cleaner castings when you use Louthan refractory gate tiles (elbows and tees to match). They prevent erosion of the gates in steel castings, safely withstand high temperatures, will not react with the molten metal. All popular diameters and lengths can be furnished.

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For More Information Circle 657, Page 39

form patterns automatically and the backup material shot into the flask. The shooter hopper is replenished with sodium silicate-bonded refractory mix from an automatically-cycled 1 cu ft muller.

The shot preform is gassed under a metal bell jar at the next station. First, air is evacuated from the jar to a vacuum accumulator tank, then pumped to the atmosphere. CO_2 is introduced into the bell jar, then evacuated to the vacuum tank and pumped back into a gas reservoir.

The preform half mold is stripped at the next station and the pattern rolled over to face the finish pattern upward. The preform half mold is lowered on the finished pattern.

At the next station, facing slurry is injected between the preform and the finish pattern. The injection head automatically is replenished through metering valves with the two basic mixtures comprising the slurry.

Molds gel and harden at the next 15 stations. Then the pattern plates with the hardened molds on top are inverted to place the preform patterns on top, ready for another cycle. The hardened molds are drawn off the finish patterns and transferred to a motorized conveyor for movement through ignition and high-pressure skin torching.

Directory of Manufacturers' Agents for 1961 Published

The third edition of the Verified Directory of Manufacturers' Representatives (Agents) has been published. It is the first revision in the last two years.

The directory lists more than 15,000 manufacturers' domestic and export representatives in the United States, Canada, and Puerto Rico. Listings are arranged geographically and include the principal products each representative carries and the trading area covered. In addition, the publication indicates prevailing commission scales for various products and includes suggested manufacturer-manufacturers' representative contract forms.

The 1961 edition may be purchased for $20 from Manufacturers' Agent Publishing Co., 554 Fifth Ave., New York 36, N. Y.

Circle 658, Page 39→

alloy briquets for the cupola charge

Each different Ohio Ferro-Alloys briquet for the iron foundry has a distinct shape and color. Costly errors in adding silicon, manganese or chromium to the charge are avoided.

Silicon briquets are GRAY and **cylindrical** in two sizes: either 1 pound or 2 pounds of contained silicon. The 2-pound size is also available in a brick shape. Manganese briquets (shown above) are RED and are **oblong** in shape. Silicomanganese is YELLOW and **square**. Chromium briquets are GREEN and **hexagonal** in shape.

For detailed information, write for **Ferro-Alloy Briquets for The Iron Foundry.** It's free, and there's no obligation.

QUALITY SERVICE DEPENDABILITY

Ohio Ferro-Alloys Corporation
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OR INCHING FORGINGS FORWARD AT 300 FEET PER HOUR . . .

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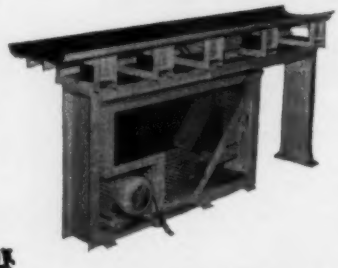

A new concept in oscillating conveyers—LIVE-FLO—is without equal where slow speed and complete control are important

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Ductile Iron Society Meets in San Francisco

Discusses Trends in Use of Ductile Iron

MEMBERS of the Ductile Iron Society, national association of producers of ductile iron castings, met at the St. Francis Hotel, San Francisco, May 11. The meeting was held during the week of the American Foundrymen's Society 65th Annual Castings Congress.

William S. Pellini, superintendent, U. S. Naval Research Laboratory's Metallurgy Division, addressed the group on impact properties of alloys. On the previous evening Mr. Pellini had received the John A. Penton Gold Medal of the AFS for outstanding accomplishment in the foundry field. Recently he received the Navy Distinguished Civilian Service Award for his work in metallurgical research.

In his talk he discussed impact properties of steels and other materials, pointing out the ability of ductile iron to withstand impact in service. Explosive tests of large square plates and drop weight tests of flat bars at various temperatures were described. For best impact properties, phosphorus and carbide content should be at a minimum, this being especially true for service at low temperatures.

A. L. Bailey, superintendent, Centrifugal Casting Co., Long Beach, Calif., discussed "Extended Holding Times Following Magnesium Treatment." He pointed out that, when casting centrifugally into a chilled mold, it is necessary to use a slightly higher magnesium content, 0.04 to 0.07 per cent, than when casting into a sand mold. At the speaker's plant, metal is held successfully for a period of 30 to 40 minutes with a loss of only 0.01 per cent magnesium. The centrifugally-produced castings are heat treated and possess an excellent and uniform ductile iron structure.

Robert S. Thompson, president of the DIS and of the H. P. Deuscher Co., Hamilton, Ohio, was the concluding speaker. Discussing "The Future of Ductile Iron," Mr. Thompson called attention to recently extended use of ductile iron castings in the petroleum indus-

try. Ductile iron valves and valve parts for service at 600° F have been approved.

A recent survey of 1030 design engineers reported in FOUNDRY, disclosed their collective opinion to be that ductile iron use will increase 67 per cent by 1965. Current production is estimated by International Nickel Co. to be running at approximately 750,000 tons per year in the free world and 250,000 tons in the communist countries for a total of a million tons expected in 1961.

GIFS Publication Wins Award

Gray Iron Founders' Society has received a Public Interest Award from the National Safety Council for its monthly publication, *Gray Iron News*, during 1960. The noncompetitive award honors annually organizations in the mass communications field for exceptional service to safety. In 1960, the society won the Safety Council's Associations Safety Award.

Book Review

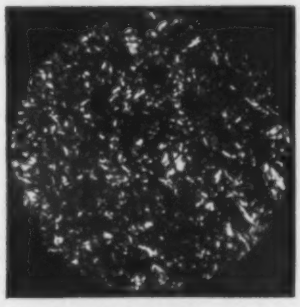
***Metals Handbook*, Vol. 1, Properties and Selection of Metals, 8th ed., 1300 pages, 8 1/4 by 10 7/8 in., published by American Society for Metals, Novelty, Ohio. Price $30.**

This new edition has expanded treatment of foundry subjects, including a separate section devoted to cast irons. Metals are treated under headings of carbon and low-alloy steels, cast irons, stainless steels and heat resisting alloys, tool materials, and nonferrous metals. Altogether, more than 200 pages deal specifically with cast metals and alloys, and these pages include 250 tables and more than 1600 illustrations.

Sections on cast metals include information on specifications, mechanical properties, physical properties, inspections, casting design, tolerances, and foundry factors. Case history examples are provided to compare cost and performance factors of two or more materials and methods used to manufacture the same parts.

Data are presented in numerical form in charts, graphs, and tables. In all, there are 6707 illustrations, 1841 tables, and 2806 definitions, including data on 456 alloys.

Wheelabrator steel shot® cleans faster because it's harder



Microstructure of Wheelabrator Steel Shot. Magnification is 500 diameters. 2% Nital etch.

A demonstration of WHEELABRATOR'S

VITAL VALUES

The harder the abrasive, the faster it cleans. And Wheelabrator Steel Shot is hard—6 to 10 Rockwell points harder than any other steel abrasive. In addition, it is heat treated to give maximum toughness and longest fatigue life consistent with its uniform high hardness. Thus, you receive the Vital Value of extra savings through reduced abrasive consumption, plus faster cleaning speed because of the higher hardness. Wheelabrator experience in pioneering airless blast cleaning progress always has meant greater savings for you. For the full story of the Vital Values and savings built into Wheelabrator steel abrasives, write for Bulletin 903-D.

VITAL VALUES FOR INDUSTRY

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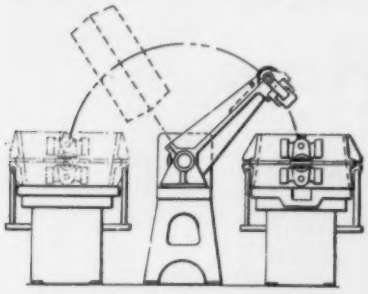
PATENTS of INTEREST

Molding Apparatus

Improved method and apparatus for making sand molds includes pin-lift mold drawing machines situated on opposite sides of a fluid-powered motor. This motor swings flask assemblies from one machine to the other in a vertical arc.

In operation, a drag flask is placed on one machine, followed



by the matchplate and the cope flask. Arms of the motor unit, equipped with horizontally moving clamping mechanisms, are moved into position and clamp the assembly. The cope flask is filled with sand from a slinger, and the assembly is swung over to the other machine. The drag flask is filled with sand, the clamping device loosened, and the drag flask is removed and set aside. An empty drag flask is placed in position, the clamping device energized, and the assembly swung back to the original position. The clamping mechanism is released, the sand-filled cope flask is removed and placed on the drag previously removed.

An empty cope flask then is placed in position and the cycle repeated. *Patent No.* 2,970,349 *granted to R. J. Hines and assigned to Hines Flask Co.*

Core Binders

Several patents describe production of binders for manufacture of sand cores for foundry use. Materials include the gelatinized amylopectin, amylose fractions of starch, and whole starch itself. These materials are treated with phosphate salts of alkali metals or alkaline-earth metals. *Patent Nos.* 2,974,048; 2,974,049, *and* 2,974,050 *respectively granted to J. W. Sietsema, J. W. Frieders, and T. E. Barlow, and all assigned to International Minerals & Chemical Corp.*

Improved Cast Iron

A method for producing gray and white cast irons having improved metallurgical qualities consists of subjecting the metal during the solidification process to vibration at a frequency of not less than 50 cycles per minute. The process may be used in combination with inoculation.

Numerous effects are cited. In gray iron greater graphitization may be obtained, also graphitization in irons with much lower silicon contents than usually employed. In white irons the usual brittle network of carbides is replaced by a discontinuous pattern of carbide needles or plates. White iron also may be graphitized. *Patent No.* 2,973,564 *granted to R. H. T. Dixon and J. H. Gittus and assigned to International Nickel Co. Inc.*

Heating Element

Self-supporting resistance heating element for vacuum furnaces is comprised of at least three elongated, arc-shaped members. They are spaced circumferentially from each other to form an open-ended cylindrical structure, and are connected at the upper ends by a heavy conductor ring.

Each member has a heavy segment bar at its lower end to introduce an even flow of electric current throughout its length. The lower end also is arranged for feeding of electric power into the member. *Patent No.* 2,971,039 *granted to H. W. Westeren and assigned to C. I. Hayes Inc.*

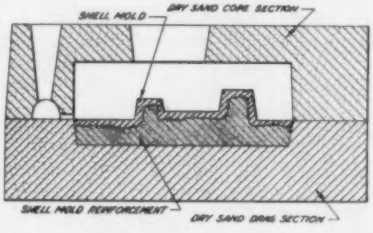
Patent Information

Two new and informative pamphlets on patents are available from the Patent Office. One, "Obtaining Information from Patents," discusses the obtaining of patents, searching of prior patents, and the many services of the Patent Office.

The other, "Answers to Questions Frequently Asked About Patents," relates to 40 questions raised by inventors and businessmen. Copies of both may be obtained from the nearest Field Office, U. S. Department of Commerce, or from the Office of Information Services, Patent Office, U. S. Department of Commerce, Washington 25.

Shell Molding

To provide a mold suitable for relatively large castings requiring a high degree of dimensional accuracy and a smooth surface finish, a composite structure is employed. It includes a relatively thin shell-



type mold face layer against which a second relatively thick resin-bonded sand layer is molded and integrally formed. The composite structure forms an insert within a conventional dry or green sand mold, and is particularly applicable for the casting of alloy steel dies for making forgings and diecastings. *Patent No.* 2,976,588 *granted to R. S. Amala and R. E. Schroeder and assigned to General Motors Corp.*

Graphitic Steel

High-carbon and alloy steels containing graphite in nodular form in the as-cast state is produced by additions of calcium and cerium as well as magnesium, lithium, strontium, and barium. These additions result in the steel containing 0.001

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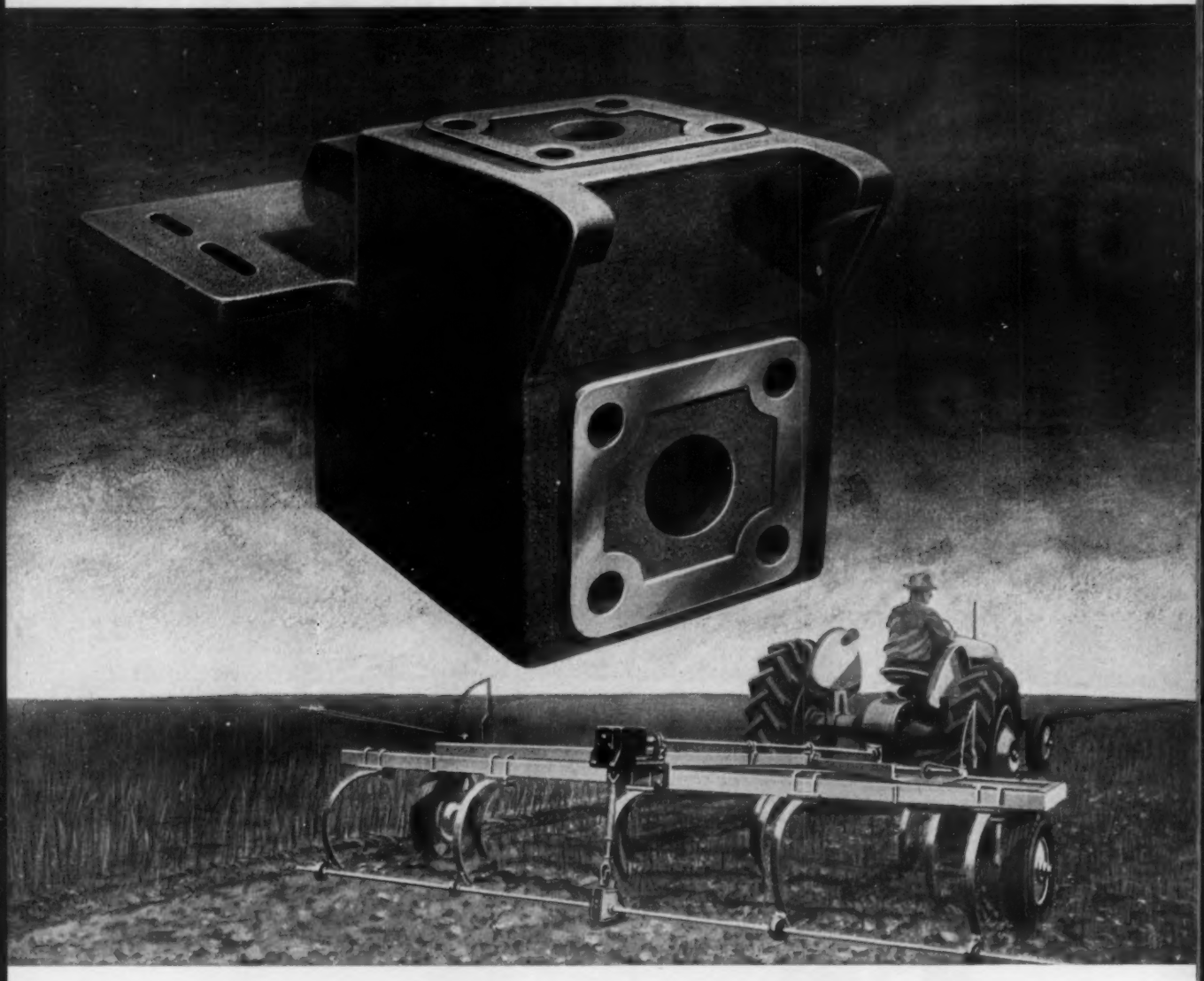
How the Foundry Industry Serves America . . . #15 of a Series



CAST IRON MITER GEAR BOX REPLACES WELDMENT, LOWERS UNIT COST 54.9%

Working off the tractor power take-off, this cast iron miter gear box operates a rod weeder that pulls out weeds as the field is plowed. Formerly a weldment, the gear box then required seven machining and fabricating operations, cost $25.32 to make. Now, as a gray iron casting, it's produced for just $11.40! Included in the cost is the cast iron cover which doubles as an identification nameplate for the equipment.

Besides lowering unit cost 54.9 per cent, the conversion from a weldment to a gray iron casting brought about improved product appearance, and increased production with less manufacturing equipment. The excellent dampening characteristics and resistance to distortion of the iron casting preserve close tolerance of oil seals and reduce lubricant leakage.

This is one more example of how versatile, modern iron castings can reduce manufacturing costs and solve many of the complicated problems of industrial design.

For the production of structurally sound iron castings, Hanna Furnace provides foundries with all regular grades of pig iron . . . foundry, malleable, Bessemer, intermediate low phosphorus and Hanna Silvery.

Facts from files of Gray Iron Founders' Society, Inc.

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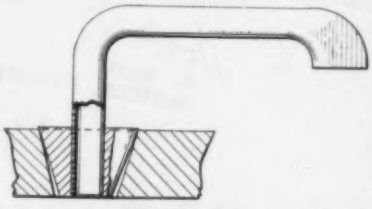
to 0.50 per cent calcium and 0.005 to 0.15 per cent cerium.

Calcium may be added in the form of an Fe-Ca-Si alloy containing about 30 per cent each of Fe and Ca and 40 per cent Si, preferably with a small amount of calcium or magnesium fluoride flux. Cerium is in the form of misch metal. *Patent No. 2,974,035 granted to T. Ototani and assigned to Research Institute for Iron, Steel and Other Metals, Tohoku University.*

Core Manufacture

In production of certain types of blown cores—such as those employed in making automotive cylinder heads containing tubular members in certain areas to form cooling jets—the tubular members must



be held firmly in position. This is accomplished by providing tapered bores in the bottom of the corebox and similarly tapered plugs to fit the bores.

Taper of the plugs is such that although it has a sealing relation to the bore, it is non-locking and may be removed readily. Plugs contain holes for holding the ends of the tubular members. *Patent No. 2,970,352 granted to J. A. Halgren, R. H. Pinkel, and A. Filinovitz, and assigned to International Harvester Co.*

Aluminum Alloy

New and improved aluminum-base alloy for castings for elevated temperature service up to 625° F with improved pressure tightness as well as improved ductility at room temperature contains 5 per cent copper, 2.50 per cent silicon, 1.25 per cent chromium, 0.50 per cent nickel, 0.30 per cent magnesium, 0.25 per cent each of molybdenum and vanadium, plus grain refiners such as titanium, zirconium, and boron. *Patent No. 2,976,142 granted to C. F. Maxwell and assigned to Howard Foundry Co.*

PQ offers the widest choice of silicates (over 70 products; 25 dry forms). You get the right one to insure the most efficient performance in your process.

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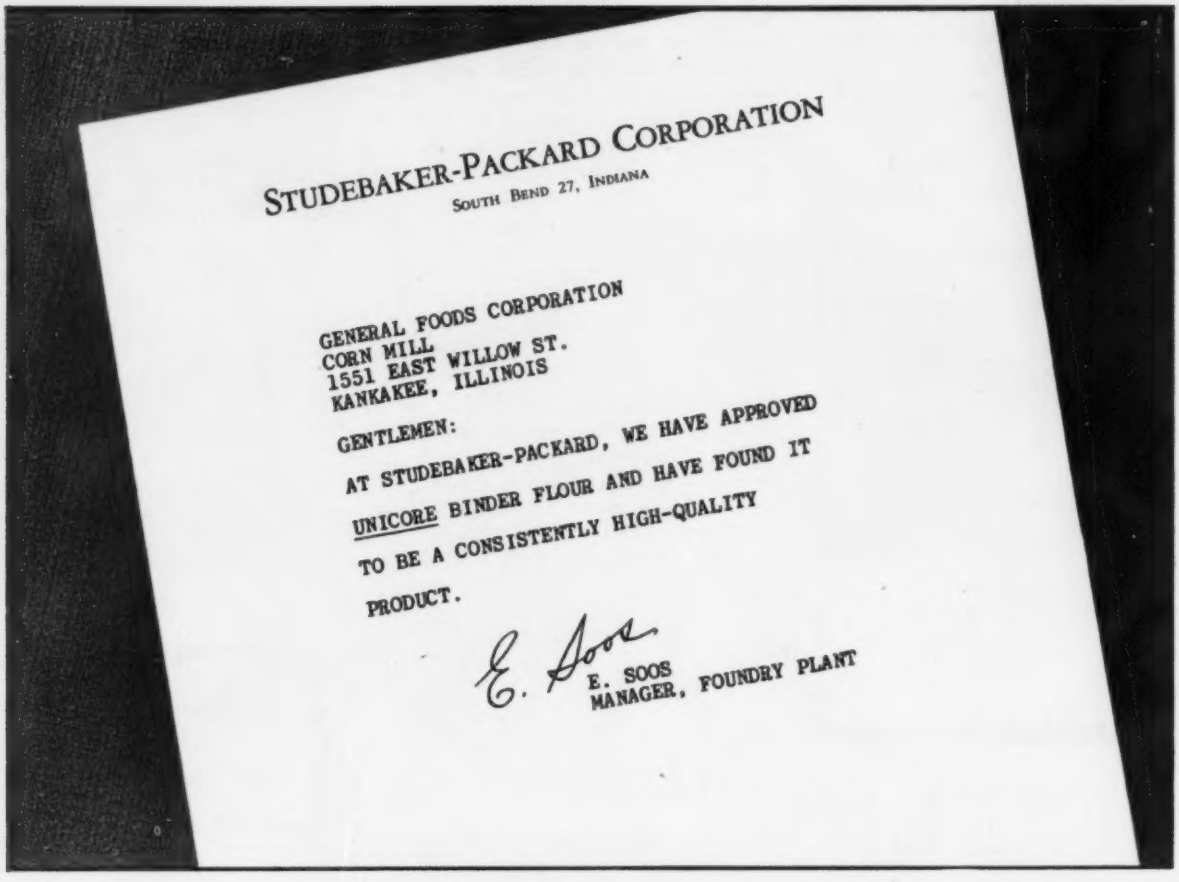

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Fig. 1—CO_2-shielded welding in action. In the background are control and power units

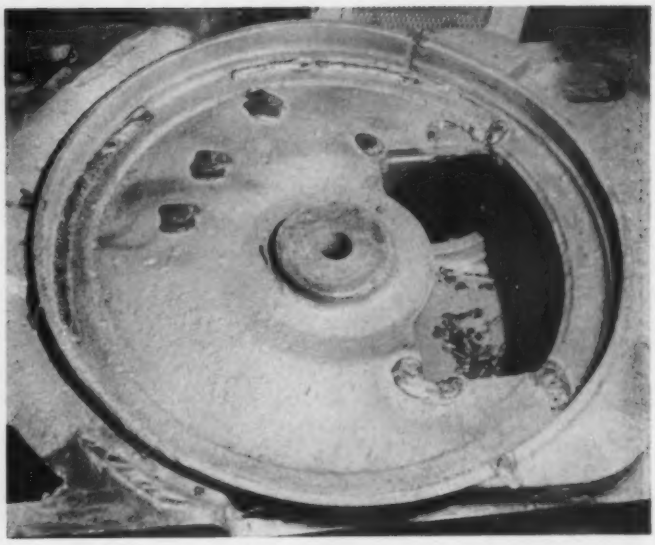

Fig. 2—This steel casting was repair-welded by the CO_2-shielded method. Fillet and puddle-type welds were used

Savings Made in

CO_2 —SHIELDED WELDING

● RECENTLY, as part of a continuing evaluation of production methods, the industrial engineering group of a large iron and steel foundry made a thorough performance analysis of welding processes used to repair a variety of steel castings.

The carefully controlled series of on-the-job tests was initiated primarily to explore the feasibility—in terms of work quality and cost—of replacing argon with CO_2 as the shielding agent in semiautomatic repair welding.

The use of inexpensive CO_2 rather than argon has for some time been a particularly attractive economic prospect to metalworking firms consuming large volumes of shielding gas in welding processes. At one time, the use of CO_2 as a shielding agent was not completely satisfactory because of objectionable spattering action.

Development of the dual shield process by National Cylinder Gas, division of Chemetron Corp. has, however, practically overcome this spattering action by using a special flux-cored electrode in conjunction with the CO_2 shielding gas.

The industrial engineering department concluded in the welding test program described here that this company would realize an estimated annual savings of $11,600 with the dual shield process.

Welding Quality—Before the detailed cost analysis was begun, the welding quality achieved with the CO_2 process was tested on several large carbon steel castings. The outward appearance of the welds on these castings indicated that the CO_2 process was entirely satisfactory and that the problem of excessive spatter had been overcome with the flux-cored electrode.

Further tests to determine penetration and porosity confirmed that the dual shield process produced entirely satisfactory welds. It was assumed, therefore, that the weld quality of the existing argon-shielded semiautomatic welding process and the CO_2-shielded method under consideration were essentially equal for this particular repair-welding application.

As part of the initial tests, both the 5/64 and 3/32-in. sizes of dual shield electrodes were used by each semiautomatic welding operator on one full shift. The operators reported that the 5/64-in. electrode enabled more work to be done in semivertical positions. The larger deposition rate of the 3/32-in. electrode in horizontal positions more than compensated, however, for the lesser amount of semivertical welding that could be done. The 3/32-in. electrode then was adopted as a standard for the remaining tests.

Cost Analysis—So that results obtained with the argon and the CO_2-shielded welding processes were directly comparable, the conditions for tests on each were made as nearly identical as possible. To eliminate the variable of casting quality from the tests, four castings of the same type were selected at random, and the operator was allowed to spend a total time of one hour on each casting. Since this procedure

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did not allow the operator to finish welding any of the castings, the variable of casting quality was eliminated at least partially.

Two trial runs were made on both welding processes. Detailed analysis of all costs included the consumption of argon or CO_2, electrodes, and labor. Results of the two trial runs were very close and indicate an average unit saving with CO_2 of 64½ cents per pound of metal deposited.

The estimated annual saving of $11,600 is based on the actual average monthly electrode consumption by two welding units in two shifts per day. Naturally, it is expected that the cost saving would increase proportionately in an expanded operation.

The Process — Fig. 1 shows a welder using the process to finish a fillet weld. The line containing the continuous electrode extends from the welding gun to the electrode spool out of the photo at left. At the right, the welding control and wire-drive unit has been placed on top of the power supply.

The partially repaired deck casting in Fig. 2 shows that the repair process includes filling chipped-out sand inclusions, fillets, and surface buildup.

Other operations which were performed on these castings include oxyacetylene scarfing, iron-powder washing, and grooving. The carbon content of the cast metal varies from 0.2 to 0.3 per cent, and casting thicknesses range from ¼ to 3 in.

Book Review

The Encyclopedia of Spectroscopy, edited by George L. Clark, cloth bound, 787 pages, 7 x 10 in., published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $25.

Volume is a survey of the entire field of spectroscopy, containing articles written by over 160 contributors. Material is written to be understood by readers unfamiliar with the subject as well as to be satisfying to the expert.

Applications of spectroscopy in industrial research and testing are considered in addition to applications in the sciences. Both qualitative and quantitative analysis by several methods are discussed. Of special interest to foundry quality

control personnel are the articles on spectrographs and spectrometers for quick analysis of metals. Pictures of many different units for such analysis are included among the 400 illustrations.

Book To Give Plan for Finding Economic Insulation Thickness

A practical means of specifying the exact thickness of thermal insulation needed for maximum economy is described in a revised edition of *Manual on Economic Thickness of Insulation for Flat Surfaces and Pipes,* to be published by National Insulation Manufacturers Association on June 15. The method was developed by Union Carbide Chemicals Co., South Charleston, W. Va., in co-operation with the College of Engineering, West Virginia University. It is applicable to any type of heat-using industry.

Charts furnished in the manual enable finding the solution to various combinations of variables involving cost of heat energy, cost of insulation, cost of capital at various periods of amortization, and conductivities of various insulations at different temperatures. Object of such calculations is to determine how thick insulation needs to be to keep costs of heat energy plus insulation at a minimum.

The manual will be available from NIMA, after June 15, for $10 per copy. Address of the association is 441 Lexington Ave., New York 17, N. Y.

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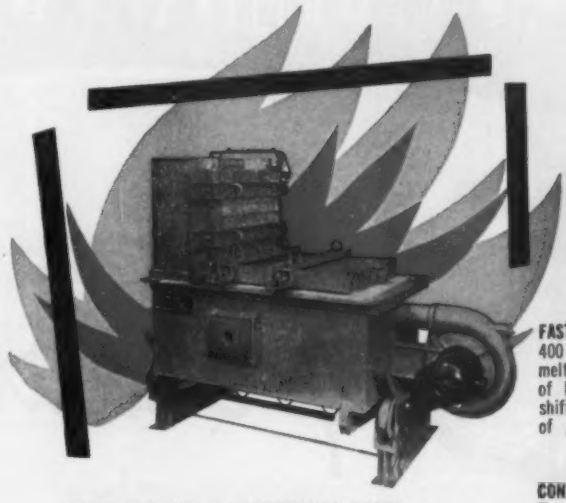

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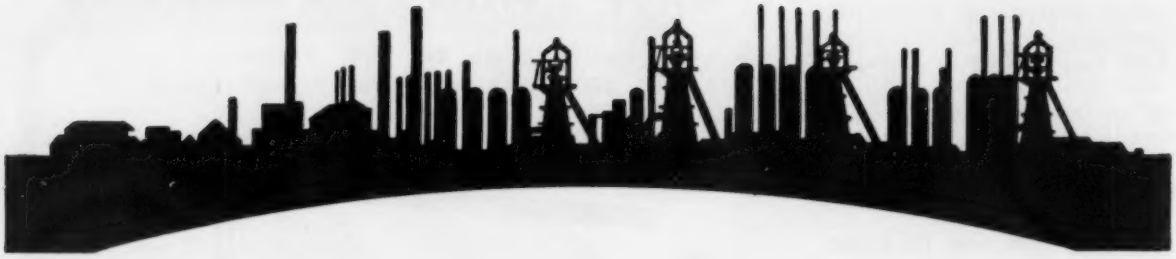

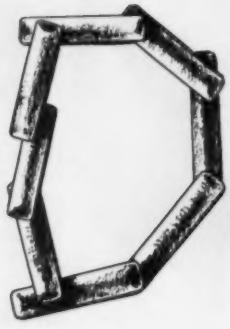

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. . . joins Taft-Peirce

DONALD S. SMITH

ROBERT C. BOEHM
. . . A. C. Williams Co. appointments

EDWIN L. ROGERS

EDWARD L. CHAMPION
. . . Misco appointments

Dr. Walter M. Saunders Jr. has been appointed metallurgical director, Taft-Peirce Mfg. Co., Woonsocket, R. I., replacing **Allen G. Shepherd Jr.**, who resigned recently as chief metallurgist to accept a similar position at Bostitch Inc., Westerly, R. I. Mr. Saunders is a past president of New England Foundrymen's Association and of the Rhode Island Chapter of the American Society for Metals.

Robert L. Pierce, for the past 11 years with Calumet Div., Calumet & Hecla Inc., Houghton, Mich., has joined Chicago Hardware Foundry Co., North Chicago, Ill., as general sales manager.

David L. Glass, formerly with the Hoover Co., North Canton, Ohio, has joined American Die Casting Institute Inc., New York, as field representative for the central regional group. He retired from Hoover Co. last year after 40 years of service.

Donald S. Smith has been named plant manager, and **Robert C. Boehm**, quality control manager and chief metallurgist, aluminum and magnesium division, A. C. Williams Co., Ravenna, Ohio. Since 1955 Mr. Smith has been vice president and production manager, Solon Foundry Inc., Solon, Ohio. Since 1952 Mr. Boehm has been with Wellman Bronze & Aluminum Co., Cleveland, recently as director of quality control. **Bernard J. Donner**, formerly plant superintendent, has been named plant manager of Williams' ferrous foundry division.

Thomas R. Wiltse has been appointed director of reliability, Central Foundry Div., General Motors Corp., succeeding **Charles E. Drury**, now divisional director of sales and engineering. **Thomas E. Smith** takes over Mr. Wiltse's former duties as manager of the division's Defiance, Ohio, plant. **Dale W. Wonus**, recently production manager of the Saginaw Malleable Iron Plant, succeeds Mr. Smith as plant manager at Danville, Ill.

Edward L. Champion, since 1952 with the Investment Casting Div., Howard Foundry Co., Chicago, recently joined Misco Precision Casting Co., Whitehall, Mich., as project engineer for the production of components for aircraft, missile, weapon systems, and marine applications. **Edwin L. Rogers** has been appointed head of Misco's ceramic core manufacturing department.

John F. Torley has been elected president and general manager, Dayton Malleable Iron Co., Dayton, Ohio, succeeding **Anthony Haswell**, who becomes board chairman after

ROBERT L. PIERCE
. . . general sales mgr.

DAVID L. GLASS
. . . joins ADCI staff

DALE W. WONUS

THOMAS R. WILTSE

THOMAS E. SMITH
. . . promotions at Central Foundry Div.

I. H. DENNEN
. . . assistant gen. mgr.

JOHN H. BATES
. . . becomes business mgr.

E. K. HATCH
. . . Osborn Mfg. Co. promotions

E. J. TEXLER

J. D. WEBSTER
. . . marketing mgr.

19 years as president. Mr. Torley had been a vice president of National Malleable & Steel Castings Co., Cleveland, in charge of operations for three of the company's plants.

I. H. Dennen, formerly director of advertising and public relations, has returned to Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, as assistant general manager. He joined the company in 1948. For the last two years he has been in the plastics and electronics fields. **John Noreen** has been named purchasing manager for B & P. He was with W. A. Jones Machine & Foundry Div., Hewitt-Robins Inc., Chicago.

John H. Bates has been appointed business manager for foundry and forge operations at the West Allis Works, Allis-Chalmers Mfg. Co., Milwaukee. He has been in the plant engineering department since he joined the company in 1957.

R. G. Martinek, has been named sales manager of furnace and oven product lines, Hevi-Duty Electric Co., Watertown, Wis., Div. of Basic Products Corp., Milwaukee, in addition to his duties as manager of special industrial furnace sales. **C. A. Newton** has become product manager of the company's light industrial furnaces, under Mr. Martinek.

E. K. Hatch has been named manager of the Machinery Div., Osborn Mfg. Co., Cleveland. **E. J. Texler** has been appointed division sales manager. Messrs. Hatch and Texler have been in sales and engineering activities since they joined the company in 1950.

H. P. Eells Jr. has been made chairman and chief executive officer, Basic Inc., Cleveland. **Warner B. Bishop,** former vice president-sales, becomes president, a position Mr. Eells has held since 1919. Mr. Bishop and **Matthew J. Ludwig,** vice president-controller of Basic, were elected directors.

Albert Kluge, formerly with Sutter Products Co., Holly, Mich., has joined Planet Corp., Lansing, Mich., as a project engineer for automated foundry materials handling equipment.

J. D. Webster, industrial sales manager, has been made manager of industrial marketing, X-Ray Dept., General Electric Co., Milwaukee, replacing **E. W. Philleo,** assigned to international operations. **Dr. W. F. Loranger** heads a new chemical process sales function to supply x-ray emission and diffraction equipment. **D. F. Raymond** assumes responsibility for sales to the federal government. **H. W. Pickett** is in charge of instrument and sensor system sales, and **S. T. Workman,** for radiation generator, image presentation system, and x-ray supply sales.

Walter I. Krewson Jr. has been appointed president, Superior Pneumatic & Mfg. Inc., Cleveland. **Kenneth Lang** has been named vice president and director of sales. Mr. Krewson joined the company in 1956.

Richard A. Hicks, formerly with Allied Welder Corp., Detroit, has joined American Zinc Institute, New York, as a market development engineer in its new Detroit headquarters. **James E. Zane,** who has represented the institute in the De-

R. G. MARTINEK
. . . furnace sales mgr.

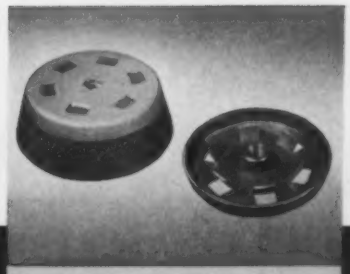
WARNER B. BISHOP
. . . Basic Inc. pres.

ALBERT KLUGE
. . . joins Planet Corp.

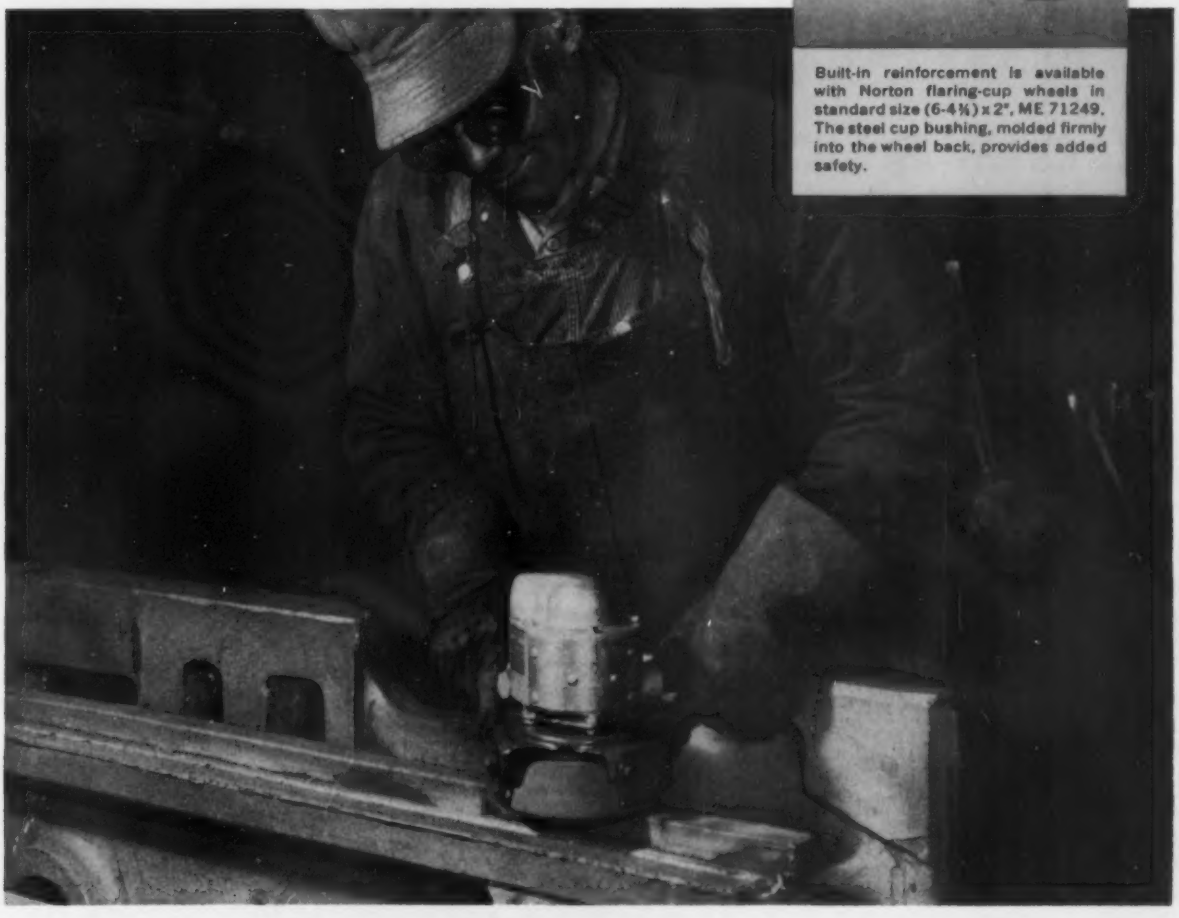
WALTER I. KREWSON JR.
. . . Superior pres.

RICHARD A. HICKS
. . . with Zinc Institute

Small snagging wheels bring you big savings



Built-in reinforcement is available with Norton flaring-cup wheels in standard size (6-4¼) x 2", ME 71249. The steel cup bushing, molded firmly into the wheel back, provides added safety.



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Your Norton Man, a specialist trained in foundry grinding, can help you make money-saving selections of 44 ALUNDUM B11 and CRYSTOLON K Bond wheels. See your Norton Distributor, or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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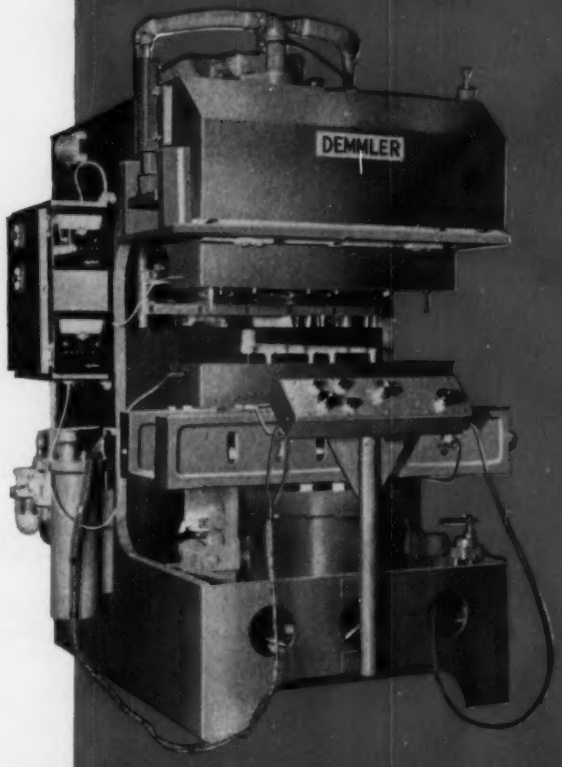

Typical cores produced by DEMMLER Edge-Blow machine:

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EDWARD H. RICHARD
. . . becomes sales mgr.

ALDO J. SARTOR
. . . Pangborn sales

EDWARD F. KOGLIN
. . . G. E. Smith director

troit area since 1958, will remain in charge of the operation.

Edward H. Richard has become sales manager-magnetics, Ohio Electric Mfg. Co., subsidiary of Howell Electric Motors Co., Maple Hgts., Ohio. He joined the company two years ago.

Emil Romans, foundry manager, Canton Malleable Iron Co., Canton, Ohio, will also act as district sales manager. **Al Wells,** former district sales manager, becomes assistant to the general manager.

R. F. Pennington has been appointed Chicago district manager, McDowell - Wellman Companies, Cleveland, responsible for sales of engineered products and services as well as those of the affiliated McDowell Co.

David Matter has been made assistant vice president of sales and service, Ohio Ferro-Alloys Corp., Canton, Ohio. **Spencer S. Phillips** has been promoted to manager of iron foundry service.

Arne E. Swanson, former sales manager, has been named assistant plant manager at the Batavia, N. Y., plant, Doehler-Jarvis Div., National Lead Co., New York. **Clyde A. Wilcox,** who has been plant superintendent, becomes works manager at Batavia.

S. Donald Sanders has been appointed manager of the Cleveland works, National Malleable & Steel Castings Co., Cleveland, succeeding **John F. Torley,** who has resigned. Mr. Sanders has been president of S. D. Sanders & Associates, management consultants.

Aldo J. Sartor, recently in the Detroit sales office, Pangborn Corp., Hagerstown, Md., has been transferred to the West Coast office of the company in Pasadena, Calif.

Edward F. Koglin has been appointed director of development, G. E. Smith Inc., Pittsburgh. Before he joined the company last year he was a sand technician with Blaw-Knox Co., Pittsburgh.

Joseph S. McVey, superintendent of sand foundry operations in Milwaukee for Ampco Metal Inc., has been named general superintendent of the company's newly relocated plant in Huntington Park, Calif.

Cameron Sevier Jr. has been appointed manager of the eastern sales district, Basic Corp., Cleveland, with offices in King of Prussia, Pa. He has been a sales-service engineer in the eastern office since 1959.

Carl F. Joseph has been named a consultant for Miller & Co., Chicago, distributor of products for the ferrous and nonferrous metal industries. Mr. Joseph retired recently as technical director of Central Foundry Div., General Motors Corp., Saginaw, Mich., after 43 years of service.

Clyde E. Bohner, formerly casting superintendent, McCulloch Corp., Los Angeles, has been named plant manager for metal castings operations in Harvill Corp.'s main plant there.

W. J. Bennett has resigned as secretary, Buckeye Steel Castings Co., Columbus, Ohio, and was named secretary-emeritus. **L. I. Day** be-

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Head thickness: .12". For use in curved core box surfaces. Heads may be scraped to conform to contour.

SCREEN VENTS
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Brass body, stainless steel wire mesh. Sizes ½" diameter and larger have supporting rods beneath screen to prevent distortion under pressure.

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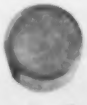

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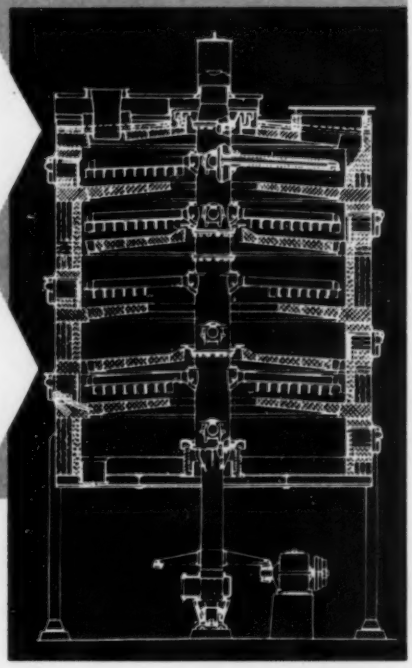

Nichols Herreshoff Furnaces will soon be reclaiming shell mold sand at two more of America's well known foundries. The Nichols Herreshoff Furnaces at Lynchburg Foundry Company and Tyler Pipe and Foundry Company will provide important operating benefits and economies, producing a reclaimed sand that will have a greater affinity for resin bonding, which will bring savings in resin costs. Of equal importance will be the reduced sand grain expansion characteristics of the reclaimed product, which will lead to closer dimensional control in shell molded castings.

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INDIANAPOLIS SAN FRANCISCO MONTREAL

STANLEY C. LONG
. . . Canadian sales rep.

comes secretary-treasurer. Other officers were re-elected. R. C. O'Kane is president-general manager.

Stanley C. Long has been appointed sales-service representative in Ontario, for Mid-West Abrasive Co. of Canada Ltd., with headquarters in Strathroy. He recently completed a training course at the parent organization in Owosso, Mich.

Watson B. Wilkins has joined Northern Bronze Corp., Philadelphia, as sales manager. He was with American Manganese Bronze Co., there.

Thomas H. Witter Jr., until recently with Soule Steel Co., Long Beach, Calif., has been appointed Los Angeles sales respresentative, Ohio Ferro-Alloys Corp., Canton, Ohio.

Russell B. Berg, until recently with Porter Cable Co., Chicago, has joined Rotor Tool Co., Cleveland, as a Chicago area service engineer.

S. Ralph Shaffer has been named general manager, and L. B. Geithman, general sales manager, Metals

RUSSELL B. BERG
. . . joins Rotor Tool Co.

HARLEY BROTZMAN
. . . joins Fuller Co.

Processing Div., Curtiss-Wright Corp., Buffalo. Mr. Shaffer joined the South Bend, Ind., Div. in 1957 as general manager. Mr. Geithman has been sales manager in South Bend since 1959.

Harley Brotzman, formerly with Pennsylvania Pump & Compressor Co., Easton, Pa., has joined the compressor division of Fuller Co., Catasauqua, Pa., as sales engineer.

Eugene H. Kolb has been named vice president and general manager, Chapman Valve Mfg. Co., subsidiary of Crane Co., Chicago, with headquarters in Indian Orchard, Mass. He was with Ralph J. Stolle Co., Cincinnati.

Warren J. Holehouse has been appointed assistant sales manager, Stearns Magnetic Products Div., Indiana General Corp., Milwaukee.

David Miller, formerly in the New York office of Corn Products Sales Co., has been appointed industrial sales representative for the upstate New York area of the Industrial Div., with headquarters in Albany. He replaces **Raymond Baird,** who has retired after 29 years with the company.

William J. Jenkins has been named sales manager, Bucket Div., Erie Strayer Co., Erie, Pa., succeeding **Charles Polinek** who has joined Blaw-Knox Corp., Pittsburgh. Mr. Jenkins joined Erie Strayer three years ago.

Paul E. Gage, formerly branch manager of the Baltimore Div., Kaiser Aluminum Chemical Corp., has been appointed sales engineer, Beryllium Corp., Reading, Pa.

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chemical and metallurgical compounds for the foundry industry

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PROTECTIVE AND DROSSING FLUXES—for reducing metal loss and eliminating oxide inclusions	Coveral Cuprit Albral Plumbral Zinc Coveral Plumbrex	Aluminum base alloys Copper base alloys Aluminum, manganese and silicon bronze alloys High leaded bronze Zinc base alloys Lead base alloys
DEGASSERS—for cleansing and removal of harmful gases	Degaser Cuprex Logas Regenerator Ferrogen	Aluminum and magnesium alloys Copper and nickel alloys Copper and nickel alloys Copper and nickel alloys Gray, malleable and high nickel cast iron
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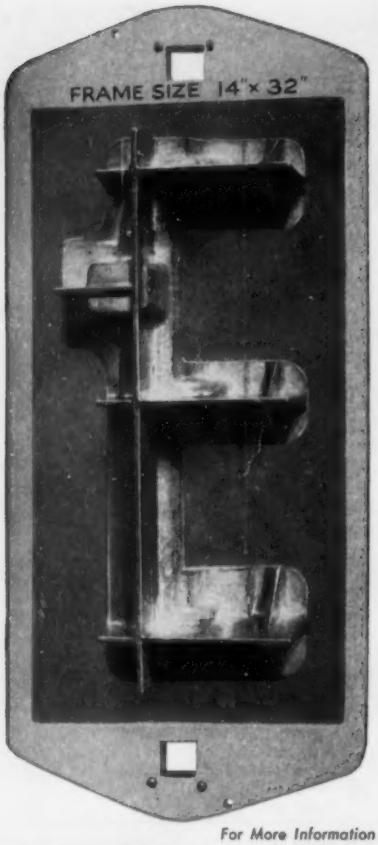

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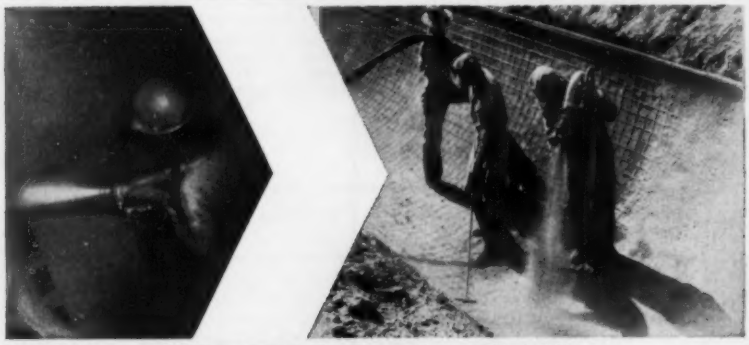
For More Information Circle 674, Page 39



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For More Information Circle 675, Page 39

OBITUARY

Leonard Geiser, president, Cincinnati Steel Castings Co., Cincinnati, died May 15.

John W. Kearsley, 93, retired foundry superintendent, Draper Corp., Hopedale, Mass., died May 2. A native of Yorkshire, England, he joined the Draper foundry in 1902. He retired in 1947.

Joseph H. Brennan, 58, chief metallurgist, Union Carbide Metals Co., Div. of Union Carbide Corp., New York, died April 19. He joined the company in 1920. Among major contributions in the field of ferroalloys was development of a process for production of ferrochrome of very low carbon content.

Dr. Matthew A. Hunter, dean emeritus, Rensselaer Polytechnic Institute, Troy, N. Y., died Mar. 24. He retired from the college in 1949, after 41 years of service. For his pioneering work with titanium and other light metals, in 1959 he received the Gold Medal of the American Society for Metals, and the annual Doehler Award of the American Die Casting Institute.

Clarence W. Boettcher, 69, formerly vice president-sales, American Foundry Flask Co., Div. of Cromb & Gagel Inc., Kansas City, Mo., died May 3. He was with Black, Sivalls & Bryson Inc., there, when Cromb & Gagel acquired it in 1957 to form American Foundry Flask.

Ervin W. Maas, 62, president and general manager, Kwik-Mix Co., Pt. Washington, Wis., Div. of Koehring Co., Milwaukee, died Mar. 17. He joined Koehring Co. in 1917, and was works manager there until 1948, when he transferred to Kwik-Mix.

Paul V. Robinson, 65, secretary-treasurer, Robinson Clay Products Co., Akron, Ohio, died Mar. 13, following a long illness. His grandfather founded the company in 1856.

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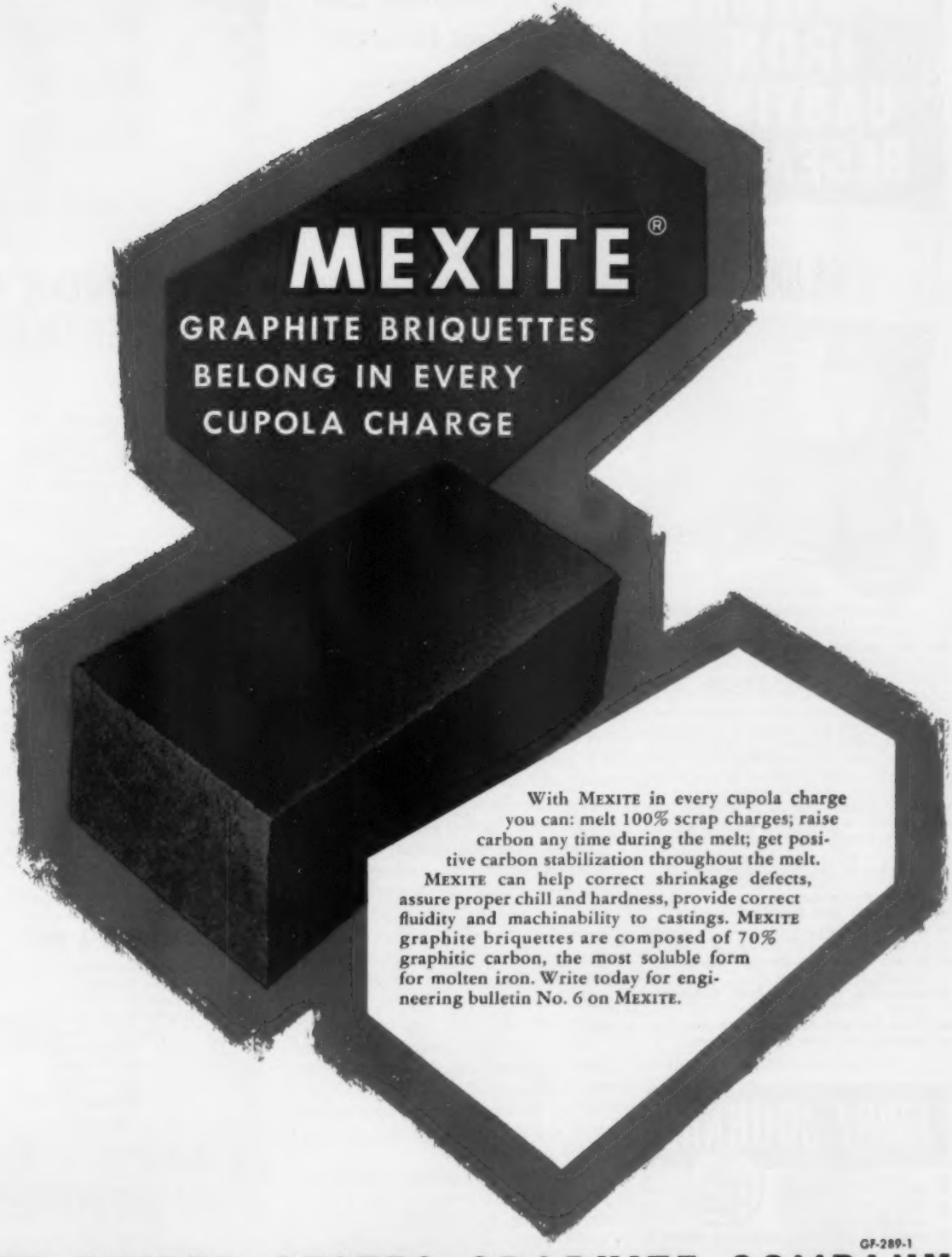

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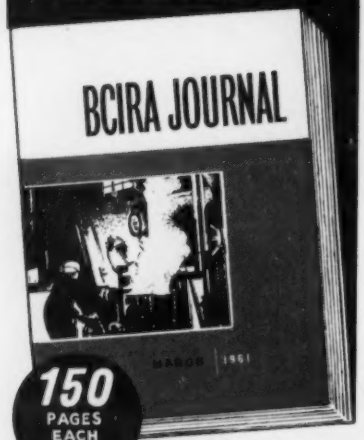

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For More Information Circle 677, Page 39

Delay by Inventors Can Cause Patent Forfeiture

Prompt action is the key to keeping patent rights

By A. W. GRAY

● FORFEITURE of a patent may be the consequence of an inventor's delay in prosecuting an action for infringement or in delaying too long to file his application for a patent after his invention has been perfected.

During 1943-45, six patents on welder control devices for use in electric resistance welding machines that were acquired by General Electric Co. were issued to various inventors. In 1957, the owner of these patents sued for infringements that had continued to the knowledge of the patent owner for more than a decade.

When this infringement action came before the United States District Court in Michigan, the court denied General Electric Co. protection from these infringements and said, "We also have found as a fact that since General Electric slept on its right in respect to the four patents before us, continuously for 13 years and in respect to patents referred to it in the negotiations between the parties, it was silent three years prior thereto and when negotiations were abandoned, remained dormant for another seven years, we hold that . . . excessive delay of this type not only deprived the patent owner of its rights to past damages, but operates as equitable estoppel to injunctive relief."

To this statement of the law the court added here in conclusion, "The fact also remains that one having patent rights cannot treat the rights given thereby without having the effect of one's own action used against him when he seeks to claim infringement."

The other type of delay, penalized in this same manner by the forfeiture of the court against infringement, occurs when the inventor unduly delays his filing of his petition for a patent. When a patent is issued to an inventor, he is given under the patent statute the right to exclude all others from making, using, or selling his invention for 17 years. For that time, and no longer,

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For More Information Circle 678, Page 39

the patent monopoly belongs to him.

Efforts by inventors sometimes have been made, however, to prolong this period. To that end, they have held inventions secret until such protection has been threatened by the discoveries of competitors, then have sought patents on the ground that they are the first inventors.

In the early months of 1938, a draftsman was directed by his employer to make the drawings for what is described as a rod mill, a machine comprised of a revolving metal drum enclosing metal balls or rods which pulverize material introduced into the drum.

The first of these machines was put into operation in September, 1938, although the invention had been made in 1936, two years before. Application for a patent for this invention was not filed, however, until five years from that date.

During that period, a second application, for a similar patent, was filed by another inventor in December, 1941. Four years later the draftsman who had perfected his mill in 1936 was charged by the other inventor with infringement.

In its decision on the action brought for infringement against the inventor who had withheld his patent application for five years after he had perfected his discovery, the court held the patent void for delay.

By the patent law it is provided that a person shall be entitled to a patent unless the invention was in public use or on sale in this country for more than a year prior to the filing of the patent application. In its relation of this statute to those circumstances, the federal court said the following.

"It has at times been thought a use is not public if from an examination of the product neither the process nor the machine by which the product was made could be understood by the art. All this is now water over the dam. The inventor's right to a patent is conditioned on refraining from exploitation of his discovery competitively after his invention is ready for patenting. While the statute allows him a limited period (now reduced to one year) to give him time to prepare the application, if he goes beyond that period he forfeits his right regardless of how little the public may have learned about the invention."

This conclusion was rested by the

"If you got so much confidence in your men in the shop, how come you're trying to buy an interest in our scrap buyer's company, McClintock?"

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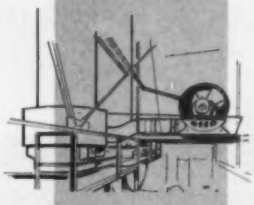

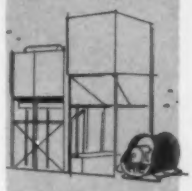

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For More Information Circle 680, Page 39

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court on a similar situation involving the manufacture of glass used in the assembling of electric light bulbs. A formula and process of manufacture had been discovered and perfected prior to 1903, but was held secret by the inventor.

Ten years later, when the manufacture of this glass had been perfected by competitors, an application was made for a patent on the process. In the meantime the product had been sold on the market under the cloak of a trade secret.

Suit for infringement against the electrical manufacturer that had undertaken the production of this glass was met by the defense that the patent had been issued in violation of the patent provision law that the discovery must not be in public use or on sale for a specified time before the filing of a patent application.

In holding this glass patent void for delay, the court quoted from a decision of the United States Supreme Court made during the early years of the last century.

"If an inventor should be permitted to hold back from the knowledge of the public the secrets of his invention; if he should for a long period of years retain the monopoly and sell his invention publicly and thus gather the whole profits from it, relying on his superior skill and knowledge of the structure and then, and then only, when the danger of competition should force him to secure the exclusive right, he should be allowed to take out a patent and thus exclude the public from any further use than what would be derived under it during his 14 (now 17) years, it would materially retard the progress of science and the useful arts and give a premium to those who should be least prompt to communicate their discoveries."

REFERENCES
General Electric Co. v. Sciaky, 127 U.S.P.Q. 154, Michigan, September 27, 1960
Huszar v. Cincinnati Chemical Works, 172 Fed. 2d 6
Macbeth-Evans Glass Co. v. General Electric Co., 246 Fed. 695

Chicago Chapter Picks Officers

Robert C. Johnston, resident manager, Hickman, Williams & Co., has been named president of the Chicago Chapter, American Foundrymen's Society. Vice president is Joseph S. Semens, foundry

foreman, South Works, United States Steel Corp. Dee C. Rose, sales representative, Wedron Silica Co., was elected secretary, and Louis J. Jacobs, director of research and development, S. Obermayer Co., was re-elected treasurer.

Elected directors are J. M. Gajentan, vice president, Chicago Foundry Co.; A. W. Anderson, general supervisor of foundry research, Manufacturing Research, International Harvester Co.; M. K. Wells, president, Wells Mfg. Co.; retiring president Donald E. Meves, senior research supervisor, American Steel Foundries; and retiring secretary William S. Duncan, sales, Pickands, Mather & Co.

Book Review

F. B. I. Register of British Manufacturers—1961, **cloth, 1162 pages, 7½ x 9½ in., published by Kelly's Directories Ltd. and Iliffe & Sons Ltd., Stamford St., London. Price 50s.**

The 33rd edition of the Register, published in close collaboration with the Federation of British Industries, lists products and services of nearly 8000 British companies under more than 5400 alphabetical headings.

In addition to this classified buyers' guide, there are seven other sections giving addresses of companies and firms and information about trade associations, tradenames and marks, etc. French, German, and Spanish glossaries give translations of every product term used in the main buyers' guide.

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For More Information Circle 682, Page 39

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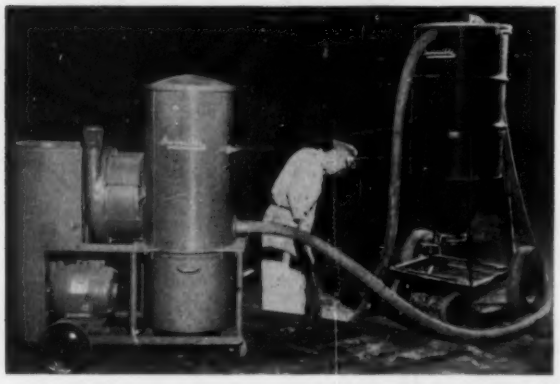
For More Information Circle 683, Page 39

Vacuum Cleaner Reduces Maintenance Cost

A VACUUM CLEANER picks up spilled sand at the Orrville, Ohio, foundry of Ohio Products Co., a subsidiary of Ohio Injector Co. When sand is dumped from flasks, it falls onto a vibrating pan conveyor which returns it to the blenders. Some sand spills over the sides, collecting under the pan and at the sides of the trench. If allowed to accumulate, it can impair or even halt operation of the conveyor.

Workers used to remove accumulated sand by hand shoveling. The job took 16 manhours per week and had to be done on week ends, at time and one-half pay, or the equivalent of 24 hours at straight time.



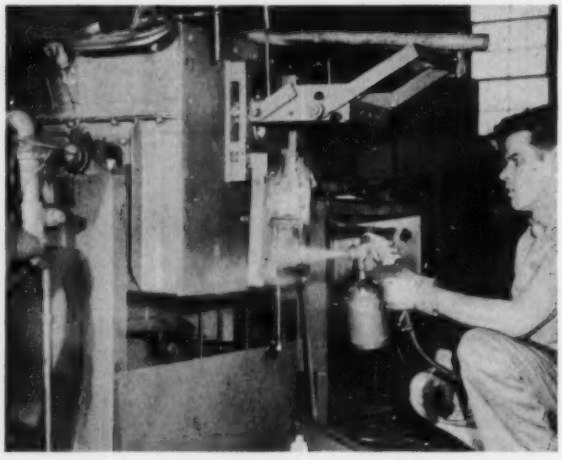
With the vacuum system, manufactured by Invincible Vacuum Cleaner Mfg. Co., Dover, Ohio, the cleaning job takes one night shift worker four hours, saving 20 hours in wages, and the unit is expected to pay for itself in less than a year. Since the system is portable, it also can be used as a vacuum cleaner throughout the plant.

For More Details Circle No. 518—Page 39

Die Lubricants Used for Gravity Diecasting

DIE LUBRICANTS are important to the operations of Akron Gravity Diecasting Co., Akron, Ohio. The firm uses the Wessel gravity diecasting process to make missile and aircraft valves, high-pressure fittings, aircraft accumulators, aircraft wheels, pump bodies, tire mold dies, small cylinder heads, and outboard motor parts. Finishes of 40-60 microinches often are obtained, and the castings are x-ray perfect, with good density and strength.

To obtain smooth surfaces and sound castings, proper die lubricants are required. Two lubricants were found to be most successful. These are a dispersion of colloidal graphite in water and a dispersion of vermiculite in water. The former is used because it can withstand temperatures above 700° F without volatizing or causing pockmarks due to gas formation. The latter is applied to thin sections of the cavity to hold in



heat and prevent the aluminum from solidifying prematurely. Both are products of Acheson Colloids Co., a division of Acheson Industries Inc., Port Huron, Mich.

For More Details Circle No. 519—Page 39

Fused Metal Coating Salvages Porous Castings

POROUS CASTINGS used to cause problems for an aircraft valve manufacturer. A group of valve body castings of 400 series stainless steel leaked so badly that more than 90 per cent had to be rejected. In an effort to salvage the castings, conventional impregnation methods were tried without success because the porosity present was too severe.

Then, a small-scale test was tried to see if Stainless Processing Div., Wall Colmonoy Corp., Detroit, could reclaim the castings with its Nicrocoat process. Previously, this process had been used only to provide stainless-type surface properties for mild steel parts or to improve surface abrasion resistance of stainless steel parts. The castings were sprayed with a 0.002-0.003-in. coating and placed in a hydrogen atmosphere furnace, where the overlay was fused to the base metal. During fusion, the overlay melted and filled the pores in the castings. When test pieces passed the inspection tests, the rest of the batch was treated. Cost of the processing was 20 per cent of the cost of the castings.

For More Details Circle No. 520—Page 39

Worried about
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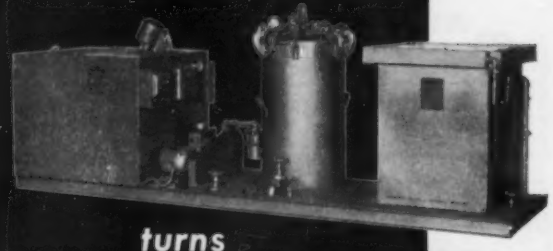

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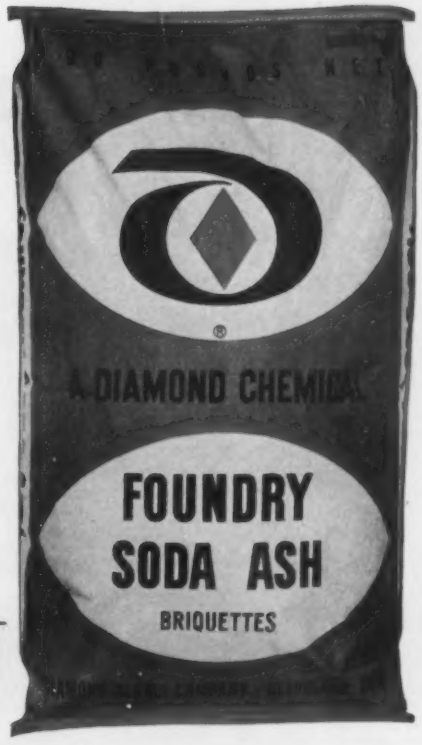

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For More Information Circle 685, Page 39

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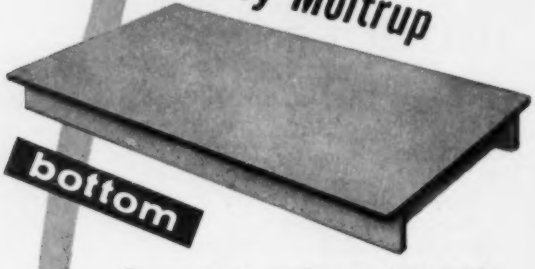

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Designed for fast action wherever quick metal removal is required. Their longer cutting life means more metal removed per disc wheel — reducing "per unit" production costs. And, because of this more efficient cutting action, Alpha disc wheels do not cause operator fatigue.

Made from abrasive grain and resinoid bond, Alpha disc wheels are strong and durable. Triple reinforcement provides greater safety while in operation.

Alpha grinding disc wheels are manufactured in 7 and 9 inch diameters in a complete range of grain sizes from 14 to 120.

Write today for full information.

Atlantic Abrasive Corp.
A DIVISION OF ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts

STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

For More Information Circle 687, Page 39

Complete facilities to produce all types of welded constructions . . . carbon or stainless steel and aluminum from 1/16" to 4" thick . . . to your specifications.

This includes tanks, chutes, hoppers, machine bases, stacks, breechings, angle rings, special cars, buckets, and other equipment.

Call or write for estimate. Let us show you how we can save you time and money.

PENN IRON WORKS, INC.
READING, PA. Phone FRanklin 6-4826

For More Information Circle 686, Page 39

For More Information Circle 688, Page 39

HEAVY DUTY
MODEL K

SPECIALLY SUITED TO PRODUCE FERROUS AND NON-FERROUS LONG TUBULAR CASTINGS

Castings up to 32 inches in diameter and 20 feet in length. These machines are ideal for jobbing foundry work as well as production.

Cast tubes of all alloys of non-ferrous metal as well as cast iron, alloy irons, steel, alloy steels and stainless steels.

Highly efficient type of water-cooling for permanent molds.

Trunnion machines built in many size ranges for specific requirements.

Illustrated Folder No. 160 Available on Request.

CENTRIFUGAL CASTING MACHINE CO.
P. O. BOX 947 TULSA 1, OKLAHOMA

For More Information Circle 689, Page 39

SPLIT-EYELET CONNECTORS

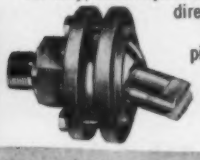
For faster, easier connection of spray nozzles, branch lines and equipment to piping and tubing carrying liquids, gases or air up to 250 psi. Write for Bulletin 93.

FOR BETTER PERFORMANCE

SPRAY NOZZLE ACCESSORIES

ADJUSTABLE JOINTS

For easy, exact adjustment of spray direction. Made in size for ¼" to 2½" pipe in brass, steel and stainless steel. Write for Bulletin 97.



...EASIER INSTALLATION

LINE STRAINERS

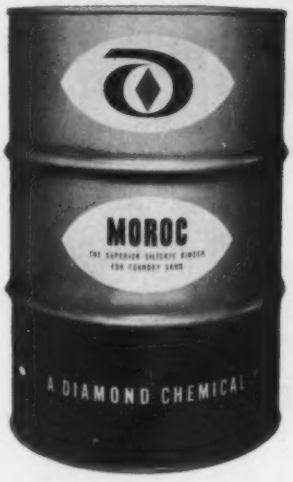
Special non-collapsing screen design for pressures up to 125 psi, for all pipe lines from ¼" to 6" size. Also high pressure strainers for up to 5,000 psi service. Write for Bulletin 94.

FOR COMPLETE SPRAY NOZZLE INFORMATION WRITE FOR CATALOG 24

SPRAYING SYSTEMS CO.
3238 RANDOLPH STREET • BELLWOOD, ILL.

For More Information Circle 690, Page 39

you get MORE with MOROC®



the controlled silicate CO_2 binder

MORE SPEED. Curing time ranges from ten seconds to three minutes, depending on type of mold or core.

MORE LABOR SAVING. Cores are ready for use when they come from core box. You eliminate movement to and from ovens, handling of core driers, cementing of halves.

MORE FLEXIBILITY. Fast curing means faster handling of rush orders. There's no need to stockpile cores for future orders. You have the flexibility to meet customer needs on schedule.

MORE PROFIT. With MOROC you can get this extra capacity and flexibility with a smaller investment in equipment than would be required for additional ovens or shell-molding equipment.

MOROC COMES IN FOUR GRADES

MOROC 1. High-strength binder.

MOROC 2. High strength and good collapsibility.

MOROC 3. High strength and high collapsibility to meet demands of core-blowing equipment.

MOROC 4. Extra-high collapsibility and good flowability.

Other Diamond Chemicals for the foundry:
Soda Ash (briquettes & granulars), Caustic Soda, Chlorine, Solvents

Write for complete information. Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio

Diamond Chemicals

For More Information Circle 691, Page 39

FOR CASTINGS THAT UNDERGO

HEAVY SHOCK AND HIGH STATIC LOADS

SPECIFY

PRECEDENT 71

ALUMINUM CASTING ALLOYS

HIGH YIELD STRENGTH • HIGH SHOCK RESISTANCE

Precedent 71 A and B are high strength, shock resistant aluminum sand casting alloys which in the condition as cast and aged at room temperature, develop the highest combination of physical and mechanical properties of any such alloy now available. Precedent 71A as cast and fully aged has a yield strength of 36,000 p.s.i. As solution heat treated and aged in the T6 condition, it has a yield strength of over 40,000 p.s.i. and still has over 5% elongation. Precedent 71B as cast and fully aged has a yield strength of 32,000 p.s.i. and at the same time has 7% elongation. Precedent 71 A and B offer a combination of high yield strength and high shock resistance not found in other aluminum casting alloys.

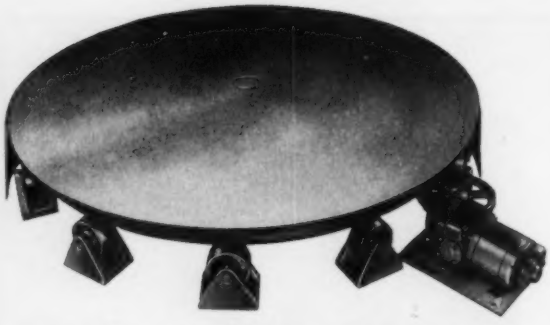
Write Today for Free Bulletin

WILLIAM F. JOBBINS INCORPORATED

J

P. O. BOX 230B
AURORA, ILLINOIS

For More Information Circle 692, Page 39



speed up foundry production with

CHASE TURNTABLES

If you need to move or turn heavy materials 45°, 90°, 180° or as much as 360° during your foundry process, consider Chase welded steel turntables for the job. Ideal where hairpin turns must be made, as well as for automatic pouring or permanent mold castings.

Manual or power-driven—roller, caster or ball type available. Diameter and capacity to suit. Any style top—plain, rail, grooved, checkered. Rotating speed of power-driven turntables is flexible.

Write for catalog or send specifications for prompt estimate.

Chase FOUNDRY & MANUFACTURING CO.

2900 Parsons Ave. Columbus 7, Ohio

For More Information Circle 693, Page 39

HIGH QUALITY SILICA QUARTZITE PEBBLES

HIGH QUALITY • LOW ALUMINA

FINELY GRADED TO DESIRED SIZE

R. W. SIDLEY, INC.

TELEPHONE CY 8-3232

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For More Information Circle 694, Page 39

FOUNDRY CONSULTANTS

APPRAISALS . . . WAGE INCENTIVE PLANS . . . COST SYSTEMS . . . EXECUTIVE CONTROL . . METHODS PRODUCTION CONTROL SYSTEMS . . .

PLANT REMODELING . . PLANT DESIGN . . CONTINUOUS SYSTEMS . . . SEMI-CONTINUOUS SYSTEMS . . . PRESENT OPERATION MODERNIZED

EDWIN S. CARMAN, INC.

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For More Information Circle 695, Page 39

Want low-cost parts finishing?

NOW—CHOOSE FROM 7 NEW ALMCO VIBRASHEEN MACHINES

TO DO YOUR

- DEBURRING
- DESCALING
- BURNISHING
- SURFACE REFINEMENT
- CLEANING

10 to 100 Times FASTER!

Note convenient height of controls.

IT'S A FACT! With the seven (7) new Almco Vibratory Machines, you can expect finishing time cycles 10 to 100 times faster than with standard horizontal barrel finishing equipment. It's a significant production breakthrough, made possible by creating constant vibratory motion to activate the entire mass of media and parts in the finishing container, as compared to only 20% activation with conventional barrel finishing methods.

The uniform vibratory motion of the media in recessed areas, blind holes and small I.D. dimensions make it possible to obtain optimum results on a multitude of applicable parts with intricate configurations that can not be completely processed in standard horizontal barrel machines.

Investigate today, the ALMCO *Vibra-Sheen way!*

FREE

SEND FOR ALMCO'S NEW PRODUCT ALBUM

ALMCO

QUEEN PRODUCTS DIVISION OF
King-Seeley Thermos Co.
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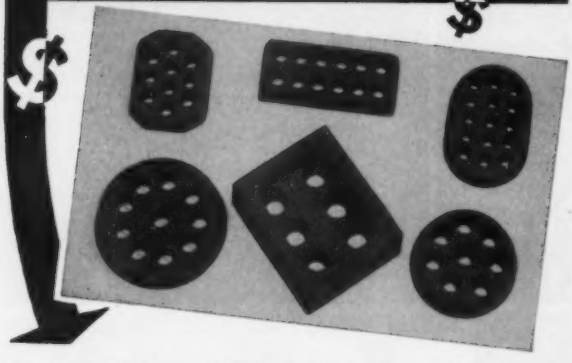
Albert Lea, Minnesota

For More Information Circle 696, Page 39

Save Money with RUDOW STRAINER CORES



Custom Made • Will Duplicate Your Sample or Drawing • Unlimited Design Range • High Heat Resistance • Extra Hard • Saves Time—Trouble

RUDOW quality Strainer Cores cut rejects, cut costs, keep castings free of oxides, slag and impurities—simplify gaiting control and metal flow, for greater production. We offer you Free Samples of RUDOW Strainer Cores—made like your sample, or from your drawing. Write today—or phone MAin 6-1163.

SEND FOR FREE BULLETINS, PRICES ETC.

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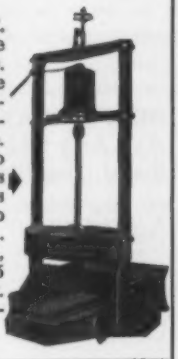
For More Information Circle 697, Page 39

MOST ADVANCED SCREENING MACHINE IN THE INDUSTRY!

COMBS GYRATORY RIDDLES

"Greatest Name in Motion"

TYPE "CS". Complete price $395.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ⅓ H.P. enclosed motor.



TYPE "CR". Complete price $385.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.

TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20" Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $545.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas Phone MU-22291
☐ Send Additional FREE Information
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For More Information Circle 698, Page 39

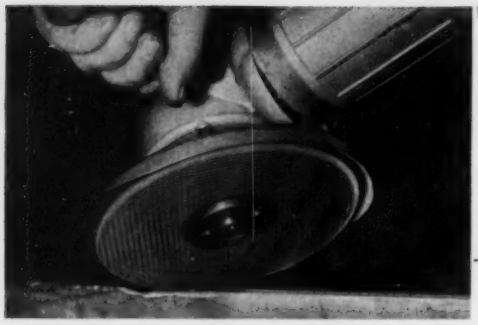


Illustration of CROWNFLEX-depressed center wheels mounted on an electric portable grinder.

We are happy to announce the establishment of our new abrasive manufacturing firm. We are presently producing in Delanco, New Jersey the CROWNFLEX line known the world over. CROWNFLEX-offset grinding wheels for use on Swing Frame Grinders and depressed center wheels and cut-off wheels provide safety and long life.

Further specialities: Waterproof Abrasive Paper, "AUTO-PAPER", Resin Fibre Discs, Abrasive Mop Wheel (Flap Wheels)

Ask for offers and samples:

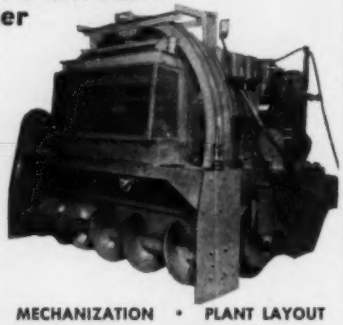
ACAW-American Crownflex Abrasive Wheel Mfg. Corp.

Delanco, N. J., P. O. Box 123, Riverside, N. J., HO-1-6400

For More Information Circle 699, Page 39

DON'T TAKE OUR WORD FOR IT!
Ask Any User of a RINGLIFT Sand Conditioner

The Ringlift does a far better job while cutting costs — ask any user (names on request). The Ringlift picks up the sand, cools, screens and aerates it, magnetically separates metal, moistens sand and returns it to the floor in neat windrows. Ask for literature.



STATES ENGINEERING CORPORATION
245 E. Murray St.
Fort Wayne, Indiana

SAND PREPARATION • MECHANIZATION • PLANT LAYOUT

For More Information Circle 700, Page 39

DIETERT DETROIT

automation equipment for production sand systems

Sand, Core, Shell and Mold Testing Equipment

CARBON and SULFUR DETERMINATORS

DIETERT DETROIT

DIETERT DETROIT

HARRY W. DIETERT CO.
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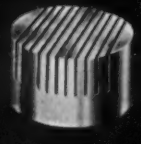
DETROIT 4, MICHIGAN

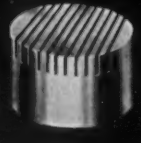
For More Information Circle 701, Page 39

SLOTTED CORE BOX VENTS



X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



DEEP HEAD .093 Wide or Narrow Slots .014 .010

CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

Manufactured by **C.M. SMILLIE & CO.** 1124 WOODWARD HGTS. FERNDALE 20 MICH

INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
- CORRECT DEPTH
- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT

VENT CLEANER

- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

For More Information Circle 702, Page 39

THE PROFITABLE ANSWER . . . . . to rising costs is an effective method and production engineering program

Our professional foundry engineering staff is successfully helping management to increase productivity—increase wages —reduce costs.
We are proud of the results obtained for our foundry clients.
Discussing our services involves no obligation or expense.
Information and references available upon request.

D. C. LATELLA & ASSOCIATES, INC. Consulting Engineers

624 WIDENER BLDG., PHILADELPHIA 7, PA. LOCUST 7-3372

For More Information Circle 703, Page 39

WITH A **GRACO**
FAST-FLO **PUMP**

Transport your liquids or semi-liquids to point of use with a Graco Fast-Flo Pump . . . *and show tremendous savings by cutting unnecessary plant traffic.*

Air powered, the Fast-Flo doesn't require expensive electrical wiring. Fits all standard drums.

Some plants handle up to 25 different materials this economical Graco way.

Investigate today. See how you can profit with Graco direct-from-drum transfer pumps in your plant.

GRACO ENGINEERS & MANUFACTURERS

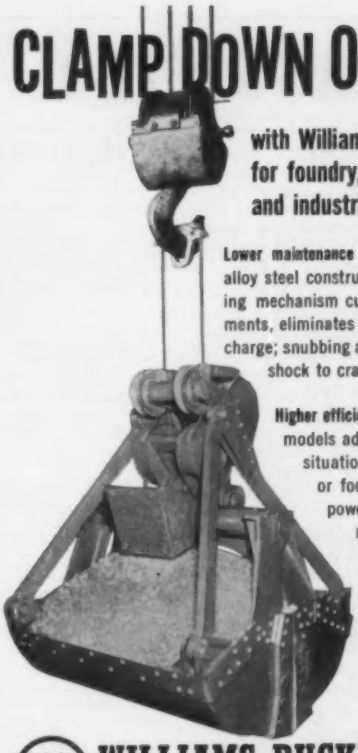
GRAY COMPANY, INC.
625 Graco Square
Minneapolis 13, Minnesota

See Phone Book Yellow Pages "Spraying" for Graco Suppliers

For More Information Circle 704, Page 39

CLAMP DOWN ON COSTS

with Williams Hook-On Buckets for foundry, steel mill, and industrial service



Lower maintenance costs: clean-cut design, alloy steel construction; sureness of latching mechanism cuts downtime for adjustments, eliminates danger of accidental discharge; snubbing action minimizes opening shock to crane.

Higher efficiency: open or closed-head models adaptable to all headroom situations; can be reeved three or four parts of line for fast, powerful bites; automatic or manual trip; medium or heavyweight models for all types of service.

If you have special requirements for buckets, let our engineers discuss them with you.

WILLIAMS BUCKET DIVISION
THE WELLMAN ENGINEERING CO.
113 St. Clair Ave., N. E. • Cleveland 14, Ohio

For More Information Circle 705, Page 39

NON-FERROUS FOUNDRY METALLURGY

By A. J. Murphy

Covers the general principles unifying foundry techniques of all industrial nonferrous metals in relation to metals in the liquid state to the process of solidification and to the factors influencing properties of casting. Other materials include the part played by gas dissolved in liquid metals, its control and its influence on cast products, factors influencing the grain size of castings, and mechanical properties of castings as complete components compared with the properties in conventional test samples.

497 pages — Price $12.50 Postpaid

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EMPIRE*

"THAT GOOD" FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION
2201 First Ave., North • Birmingham 3, Ala.
Phone: ALpine 1-9135

*Reg. U. S. Pat. Off.

For More Information Circle 706, Page 39

HARTLEY CONTROLS CORPORATION

NEENAH • WISCONSIN

Originators of Fully Automated Sand Systems for Foundries

For More Information Circle 707, Page 39

Use an Inquiry Card

For further information on anything described or advertised in this issue . . . . . .

SEE Page 39

CLASSIFIED ADVERTISING

• HELP WANTED

MOLDING FOREMAN

For light gray iron and alloyed iron foundry located in Chicago area. Experienced in rigging of jobs for production, gating and risering. Must be capable of training molders and have a thorough knowledge of cause for casting defects. Excellent opportunity for qualified individual to grow with progressive organization. Submit full particulars regarding personal data, education, and experience. All replies confidential. Address: Box 956, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER

A young graduate mechanical or industrial engineer will find a challenge in the position of Foundry Engineer with special alloy and stainless steel foundry in Ohio.

Working directly under an engineer in the foundry management, the Foundry Engineer will be responsible for planning and improving the production of corrosion-resistant castings.

Two or three years of foundry experience and management potential desirable.

BOX 910, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO.

STEEL FOUNDRY SUPERINTENDENT

Medium size steel foundry near Cleveland. Specializing in medium jobbing work. Must know all phases of steel foundry operations and alloys. In reply give age, experience, and references.

BOX 933, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MOLDING FOREMAN

Experienced aggressive man required as foreman over mechanized production green sand units. Gray iron shop located in North Jersey. Send complete resume and salary requirements. Address: Box 942, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

YOUNG FOREMAN SUPERINTENDENT
($8,000 to $10,000)

For a modern foundry. Client assumes the employment fee. Contact Robert L. Moore in confidence.

MONARCH PERSONNEL
28 EAST JACKSON BLVD. CHICAGO 4, ILL.

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Metallurgical and quality control engineer for plaster mold precision foundry, nonferrous materials. Address: Box 959, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SENIOR INDUSTRIAL ENGINEER

Excellent growth opportunity. Must have background in standard data, estimating and methods. Midwestern foundry location.

BOX 943, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

EXPERIENCED MELTER

Electric Arc Furnace, acid practice, carbon, low alloy steel, ladle linings. Salary open. Replies confidential. West Coast Location. Address: Box 921, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PLANT MANAGER'S ASSISTANT

For cast iron enamel plumbing fixture plant, to back up manager. Address: Box 948, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

FOUNDRYMAN FOR SALES SERVICE POSITION

Rapidly growing Mid-West Company (not a foundry) requires experienced foundryman for Sales-Service position. Applicant should:

a. Be thoroughly familiar with heading and gating practice and costing procedures in ferrous work: preferably steel.
b. Possess Engineering or Metallurgy degree or equivalent experience.
c. Have had customer contact through sales or service.
d. Be willing to travel 60 - 70% of the time.
e. Preferably be in the thirties.

Write with attached resume and indicating range of salary requirements to . . . . . .

BOX 919, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PRODUCTION MANAGER
Midwest Foundry

Well known custom foundry in Midwest has need for an experienced foundry manager to take complete charge of the nonferrous foundry employing 50 people. Precision castings in aluminum, brass and bronze. The man we seek must have at least ten years experience in nonferrous foundry; knowledge of engineering (metallurgy preferred), gating, risering, general metallurgical problems, quality control and industrial relations. He should be good at directing people and gaining their respect. This is a permanent position in well established company with growth and advancement opportunity. Five figure salary and fringe benefits. Answer with complete resume in strict confidence.

BOX 945, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

GENERAL MOLDING FOREMAN

Steel experience a MUST—age 25 to 45. Please include complete resume and salary requirements in first reply to Personnel Department . . . . . .

GUNITE FOUNDRIES DIV.
KELSEY-HAYES CO.
301 PEOPLES AVE. ROCKFORD, ILL.

FOUNDRY CHEMIST

Experienced RESIN CHEMIST wanted by leading producer of foundry core binders. Must be college graduate with chemistry major. Practical foundry experience desirable but not essential. Excellent compensation and fringe benefits for right man.

Send resume to . . .
BOX 951, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PLANT MANAGER

Medium-heavy mechanized Meehanite iron foundry, Midwest location. 150 employees. Excellent future. State education, experience, salary requirements, etc. Furnish late picture. Write Box 917, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CHIEF INSPECTOR

To take full charge of Inspection Department. Some customer contact work involved. Midwest steel casting foundry with normal employment of about 450. In reply please indicate qualifications, experience, and salary requirements. Address: Box 916, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERVISOR

Molding Department. Experienced in high quality alloy steel castings, advanced shank and screw ladle pouring practice, machine molding. Salary open. Reply confidential. West Coast location. Address: Box 922, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SQUEEZER FOREMAN

Jobbing steel foundry needs squeezer molding foreman. Must know heading and gating. Excellent opportunity for advancement. Address Box 928, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Degree or equal—25 to 35 years of age—4 years' or more experience in steel or gray iron. Knowledge of heat treating, melting and sand technology desirable. Apply Personnel Department. . .

GUNITE FOUNDRIES DIV.
KELSEY-HAYES CO.
301 PEOPLES AVE. ROCKFORD, ILL.

• HELP WANTED

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Better opportunity, security? "NER" reports on hundreds of $7,000—$35,000 Executive Job openings monthly. Get free Report. Strict confidence. National Employment Reports, 20 East Jackson, 902-U, Chicago 4, Illinois.

• POSITIONS WANTED

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Practical and technical; presently employed in the East; over 30 years' experience; jobbing or production to 5 tons. Address: Box 940, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER

B.S. Metallurgy. Age 49. 28 years' experience all phases with extensive consulting and project experience U. S. and abroad. Will consider project assignments. Address: Box 935, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Steel foundry, electric arc furnaces, basic or acid practice. Carbon, alloy and stainless steels. Capable of taking full charge including budget and incentive systems. Address: Box 936, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ENGINEER

Fourteen years' diversified experience in the field of foundry operation and engineering. Age 37. Interested in a responsible position of foundry engineer, plant engineer or foundry equipment designer. Address: Box 939, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPPLY OR EQUIPMENT SALESMAN

Thirty years as foreman and superintendent in high production foundries. Would now like to have position as salesman for a reliable company selling foundry supplies or equipment. Address: Box 930, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING FOREMAN

Twenty years' EXPERIENCE in steel foundry. Floor molding and machine molding; Bumpers or slingers. All types castings to 20 tons. Address: Box 947, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Thirty years' experience supervising in gray iron foundries; both jobbing and high production on squeezers, rollovers and sand slingers. Well versed in sand control, gating and cupola operations. Address: Box 931, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT

Thirty years' experience in steel, high alloy, iron, nodular and malleable. Age 51. Castings up to 20 tons. X-ray and magnaflux quality. Can produce at a profit. Good labor relations. Resume on request. Address: Box 932, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Gray-iron foundryman. Twenty years' executive experience. Well versed in metallurgy, molding and cupola practice mix by analysis. Address: Box 950, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Twenty-five years in supervision, experienced in gating and sampling, squeeze, cope and drag work. Prefer malleable job shop. Will relocate. Address: Box 934, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT—MANAGER

Twenty years' practical and technical experience in all types of ferrous and nonferrous foundry operations in foundries in U. S. A. and Europe. Fourteen years' supervisory experience, sales and metallurgical background. Age 47. Now employed. Address: Box 958, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

DESIGNER OF PERMANENT MOLDS

Specialist in missile and aircraft castings of Aluminum and Magnesium. Location New York —New England area. Address Box 927, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

METALLURGICAL ENGINEER

B.S., M.S. in Metallurgical Engineering. Married, children. Age 32. Six years' experience in research, development and technical service mostly in castings and foundry supply areas. Publications. Desires technical service and sales or production position. Will relocate. Resume on request. Address: Box 941, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Twenty-seven years' job and production foundry experience. All departments: Gray iron, alloy iron, nonferrous. Some college teaching. Nineteen years supervision. Age 46. Now employed. Resume on request. Box 954, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT-MANAGER

Got high scrap? Low production? Sand troubles? Want help? If you need a competent Superintendent-Manager, I can carry the load for you. Let's talk it over. Address: Box 953, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGEMENT ASSISTANT

Experience in all duties of management including time-study and incentives. Aluminum and gray iron foundry experience. Resume sent upon request. Address: Box 914, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER

Practical, progressive and technical trained foundryman. Well versed in all departments of ferrous jobbing foundries, on castings up to 25 tons. Cost and quality minded. Excellent labor relations. Age 48. Now employed. Address: Box 938, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Age 37. Seventeen years practical experience in iron and steel. Six years as supervisor, molding and some core room, jobbing or production shop. Will relocate. Address: Box 946, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Experienced in gray iron and nonferrous metals, mechanization, design, patternmaking, gating, risering, costs. Presently employed as pattern supervisor. Address: Box 924, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST—SUPERINTENDENT

University graduate. Experience in all phases of gray and ductile iron, acid and basic, with unlined water cooled cupolas; jobbing or production. Green and dry sand molding, quality control employing latest laboratory and scientific techniques. Now employed. Seek challenging position with progressive organization. Will consider opportunity in sales. Address: Box 912, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MELTER—LABOR FOREMAN

Experienced in aluminum alloys to aircraft and missile specifications. Knowledge of basic metallurgy necessary to produce consistently high-quality melts. Supervised pouring and labor crew in medium-sized foundry. Presently employed. Address: Box 929, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES REPRESENTATIVE

With twenty-five years' experience selling foundries and steel mills east of Mississippi, seeking new connection. Experience includes sales of refractories. Address: Box 918, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

30 years' experience nonferrous foundry. Industrial, ornamental, architectural, tablet and memorial castings. Green sand, skin dry and French sand molding. Desire change. Address: Box 926, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Practical foundryman, nationally known for a job well done. Age 48. Good health. Now employed. Looking for more action ferrous or nonferrous. $15,000 minimum. Address: Box 925, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER

Metallurgist with excellent foundry background and good management experience seeks opportunity with growing, progressive foundry. Experience includes foundry supervision and management, production control, quality control, purchasing, research, plus early trades training. Present earnings in low five figures. Address: Box 952, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• EMPLOYMENT SERVICE

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS PERSONNEL DIRECTORS, PURCHASING AGENTS
Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact
DRAKE PERSONNEL, INC. FINANCIAL 6-8700
JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

• POSITIONS WANTED

FOUNDRY SUPERINTENDENT OR MANAGER

Progressive foundryman needs new challenge. Experienced iron and steel, productions and jobbing. On present job labor costs cut in half in four years' time. Presently employed. Address: Box 957, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Competent and progressive foundryman would like to make change. Will relocate. Address: Box 955, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT—MANAGER

Technically, practically familiar with every phase of foundry operations. Broad experience in ferrous and nonferrous. Will relocate anywhere. Address: Box 949, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

SALESMAN

To cover Ohio for well known Manufacturer's agent with six good lines. Straight commission basis. Address: Box 944, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRY CONSULTANTS

CONSULTANT

In foundry operations gray iron, malleable iron and steel. Address: HERBERT F. MILLER, 589 Trade Winds Drive, Dunedin, Florida.

FOUNDRY CONSULTANT—NONFERROUS

Sand casting—Permanent mold casting—centrifugal castings—in aluminum, brasses, bronzes, 30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, West Palm Beach, Florida. PHONE: TEMPLE 2-8685.

• FOUNDRIES FOR SALE

FOR SALE

Gray Iron Foundry, complete with Whiting Cupola with 64" shell; newly constructed on 5 acre tract with Southern Railway siding and excellent motor carrier facilities; Stran-Steel foundry building and separate office-pattern building. 3 miles from industrial center of Lynchburg, Virginia in Amherst County with low taxes. Established local customers for special castings and extensive stock of patterns available. Substantial tax loss benefits. Inspection and detailed information to interested persons on request.

ABBOTT FOUNDRY COMPANY

MADISON HEIGHTS, VIRGINIA

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In the center of fast growing Southern California. Medium Size. Facilities for permanent moldings and sand-castings. Small machine shop. A-1 finishing shop. Land, buildings and equipment included in a growing business for $150,000.00 Terms. Contact . . .

BOX 84

SANTA ANA, CALIFORNIA

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WANTED TO BUY

WATER WORKS FITTINGS patterns: mechanical joint, lead joint, Ringtite and Fluidtite. Please contact . . . Address: Box 937, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Manufacturer of very competitive hardware items located in metropolitan New York desires gray iron foundry to cast and machine (tapping inside and outside threads) their work. Speedy delivery important. Address: Box 920, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Used 2 ton or 3 ton Electric Arc Melting Furnace complete with transformer and controls.

Contact . . . W. T. Lindsay

GENERAL ELECTRIC COMPANY

BLDG. 50—ROOM 105

SCHENECTADY, NEW YORK

• FOR SALE

G-U-A-R-A-N-T-E-E-D

SAND BLAST EQUIPMENT

SELL BUY TRADE

TERMS AVAILABLE

Designers and Erectors of Specialized Blast Equipment

14' Wheelabrator Table Blast Model 4 with 4-66" Spin Tables like new	$10,000.00
4' Wheelabrator Table Blast	2250.00
6' Wheelabrator Table Room	6000.00
6' Wheelabrator Air Table	1700.00
48 x 48 Wheelabrator Tumblast	3000.00
42 x 48 Wheelabrator Tumblast	2750.00
36 x 42 Wheelabrator Tumblast	1500.00
4' Sly Air Table	600.00
27 x 36 Wheelabrator like new	3000.00
Sly Air bbl #4	350.00
6' Pangborn Swing Table, Like New	6000.00
Pangborn 53 EN-2 Hand Cabinet	325.00
Rumelin 8 x 8 Room	1000.00
Pressure Tanks, all types	$150.00 up
Vapor Blast Cabinets	400.00
Vapor Blast Automatic Table	2500.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention. $100,000 worth of Wheelabrator and Pangborn Spare Parts Priced 25% to 50% Less List.

170 STEEL SHOT MIXED WITH 680 STEEL GRIT ..... $125.00 ton

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(Used—Excellent condition!)

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MARSCHKE 15 hp. 220-440 V. takes up to 24" wheel ..... $750.00 each

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LAFAYETTE 1-1322

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12 x 10 Chicago Pneumatic Compressor with 60 H.P. Motor. Capacity 300 CFM. Compressor completely overhauled. Excellent condition. Price $1,450.00 f.o.b. Alpena. Address: THUNDER BAY MFG. CORPORATION, Alpena, Michigan. Phone: ELMWOOD 4-3181.

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At Elizabeth Port, N. J.

NEW EQUIPMENT

Skleenar Reverberatory Furnace Oil Fired, 1 Ton Cap.
B & P Swing Slinger
B & P 5 Ton Plate Feeder—Complete
B & P 12′ Indexing Table
2 Whiting 1 Ton Geared Holding Ladles

USED EQUIPMENT

B & P Tractor Slinger
2 American Tumblasts—36″ x 42″ with Loaders
Pangborn Multi-Table Rotoblast 8-20″ Tables
Pangborn Sand Blast Room Complete 10′ x 12′
3 Simpson #2 Mullers—with Loaders
Simpson #3 Mullers
B & P #50 Speed Muller with Loader
Simplicity 4′ x 8′ Shakeout
3′ x 4′ Robbins Shakeout
Howe 5000 Lb. Cap. Floor Scale
3 Aluminum Melting Furnaces With Micromax Controls
100 Pigging Unit—24″ x 9″ pigs
5 I-R 2000 Lb. Air Hoist
20 Cylindrical Ladles
Fisher El Tilt furnace—400 lb. cap.
Coleman Vertical Tower Core Oven—3′ x 6′ Trays
Aluminum & Steel Flasks
Flotex Gyra Screen Shakeout 4′ x 6′
3 Ross—Dip Painting & Baking Ovens 60′
Ross—Baking Oven—Hi Temp. 40′
Belting—Conveyors—Drives — Magnetic Pulleys
Pangborn & Sly Dust Collectors
Sly & Whiting Tumbling Barrels
Chain Hoists
5 Spencer Turbo Blowers
12 SPO 110 PJ Jolt Squeezers
Am. Wheelabrator Tumblast 27″ x 36″
Tannewitz 30″ Band Saw—Variable Speed Drive
B & P Mulbaro—3½ Cu. Ft.
SPO—21146 Jolt Squeeze Pin Lift
Rover NBP 18″ Belt Sand Slinger
2 B & P #M Screenerators
2 B & P #S Screenerators

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M. ELSTEIN

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Elizabeth, N. J.
Phone Elizabeth 5-2300

For More Information Circle 866, Page 39

• FOR SALE

FOR SALE

THE FOLLOWING ITEMS ARE FROM A FOUNDRY WHICH NEVER GOT INTO OPERATION!

One — Melting Furnace — Reda — Model 550-CS Complete with blower, motors, etc. Never used, still mounted on the delivery skids! F.O.B. Tucumcari.
One—Blodgett oven, Type 147.
Twenty-four—size 16 x 20 x 6 inch deep never used flasks.
Fifty-five—size 20 x 20 x 6 inch deep never used flasks. Factory price new around $50.00 each. F.O.B. Tucumcari, New Mexico.

Many more parts for foundries,

including several dozen never used soil pipe molds. Many melting pots, blowers, fittings, tables, jigs, burners, etc. are available. Will sell complete outfit F.O.B. Tucumcari.

WRITE . . . OR . . . CALL
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FOR SALE

B & P Model 6024, 6000# hydraulic rollover draw machine complete and in excellent shape, 24″ draw, 64″ daylight, straight-in conveyor, 90° rollout conveyor.

B & P Rotomold, four roller conveyor station, pneumatically operated, 18′ dia. indexing table, capacity 6000# per station, complete and in excellent condition.

Both may be seen in operation. Will sell separately or as a unit.

BOX 915, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE

Simplicity Feeder
30″ x 72″—3 H.P.—220/440-60-3
Type OA-10-JA-2
Serial #306-OF-JA2-984
Spring and cable mount
Unused, purchased 1960.

WELLS MANUFACTURING COMPANY
SKOKIE, ILLINOIS MR. J. T. MOORE

FOR SALE

Shalco Shell Core Blowers—Electrically Heated

Model MCM-6, 19″ x 28″ platen, 36″ between plates, Serial #383, Semi-Automatic — Reconditioned $4500.00; As is $2100.00

Model MCM-6, 19″ x 28″ platen, 24″ between plates, Serial #491, Semi-Automatic — Almost New $7750.00

Model CTA-18, 18″ x 18″ platen, 26″ between plates, Serial #935, Automatic with Sand Feed $5000.00

Gas Heated

Model CTA-18, 24″ x 18″ platen, 26″ between plates, Serial #936, Automatic with Sand Feed $5000.00

Shalco-Fordath Shell Sand Mixers

250-lb. Batch, with Air Heater, Vibrating Screen — Reconditioned $5540.00

250-lb. Batch, with gas-fired Air Heater — Good Condition $4000.00

800-lb. Batch, #2 Standard, 25 HP Motor, for oil sand, CO-2 or Furfuryl core sand — Unused $6850.00

All Prices F.O.B. Cleveland, Ohio

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CLEVELAND 8, OHIO
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PHONE: FR 6-0794

FOR SALE

One Used #3 Unit Drive Simpson Muller. Good condition. Address: Box 923, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EQUIPMENT

(2) Es-1 Mott Sandblast Barrels—1½ Cu. Ft. 220/440
(1) American Wheelabrator 48″ Swing Table—(Late)
(1) American Wheelabrator 27″ x 36″ Rubber Belt Excellent Condition
(1) American Wheelabrator 27″ x 35″ Steel Flight Excellent Condition
(1) American Wheelabrator 1-A Table—19″ x 26″ Dia. Table
(1) Hollingsworth (Air Less) 5 Cu. Ft. 30″ I.D. x 31″ Lgth.
(1) Pangborn—Sandblast unit AU-11 Tank C/W BVR Separator, Elevator and Remote Control.
(1) American Wheelabrator #4—Model 112 CFD—7½ HP 220/440—3500 CFM—Dust Collector 1958
(2) Sly Tumbling Barrels—36″ Dia. x 72″ Long 10 HP. Master G.H. Mtr. 220/440

CORE ROOM EQUIPMENT

(2) San-Bio Model CB-40-D & CB-40-B
(1) Redford #1 Bench—C/W Air Clamps & Cartridges
(1) Redford #2—26″ x 30″ Table 12″ Core Box Height 5# Core W/Head (Never Used)
(1) Core Redry Oven — Milwaukee 2,000,000 BTU—Gas 55′ C.C.Lg. Conveyor—60″ Wide—34″ Height over Conveyor—Slat Type.

MOLDING MACHINE

(1) Milwaukee #167 Jolt Squeeze—R.O. & Draw-Table 32″ x 33″—12″ Draw —16″ Cyl. 1000# Cap.
(2) Osborn #7012-Jolt-Squeeze Pinlift Table 21¼″ x 24″—6″ Draw 12″ Cylinder—Cap. 750#
(2) Tabor-Jolt-Top Squeeze 10″—Cylinder 500# Cap. Table 16″ x 19″
(1) Davenport — JS - 10 - Plain Jolt — 3000# Cap.—Table 42″ x 48″
(1) Milwaukee 125-3A Jolt Squeeze Pin Lift—8″ Draw—12″ Cylinder—Cap. 1200# Table 21″ x 27″
(1) Davenport Jolt Rollover—24″ x 38″ Pattern Draw 12″ Cap. 1000#—With Air Clamps

MISC. FOUNDRY EQUIPMENT

Motive Sandslinger—1952, Belt Conveyors, (3) Hewitt Robins Floatex Shakers. (3) Bucket Elevators, Permanent Magnetic Belt Conveyor, (2) Screenerators—S & M.—Stroman JC-7 Melting Unit. (1) Sweco Model D-20-48″ Separator (56)

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List your surplus equipment with

Phone ES-8-5648

FOUNDRY ASSOCIATES
927 S. Cicero
Chicago 44, Illinois

For More Information Circle 867, Page 39

• FOR SALE

FOR SALE

OSBORN—#332 Jolt R.O. (Power Rollover) Squeeze Pattern Draw (9" Draw) Molding Machine. Cost new $7,250—Rebuilt and Guaranteed: $1,250
PREPARATOR—#60 Beardsley & Piper Rebuilt and guaranteed
CUPOLA BLOWER—Ingersoll-Rand Type FS-555 9,650 C.F.M. @ 36 Ozs. 3/60/2300—125 HP Direct-Connected GE Motor w/Controls
MOLD or CORE OVEN—Porbeck Recirculating Gas-Fired—all controls—used less than a year—14' x 20' x 11'6"
AMERICAN "TUMBLAST"—48" x 72"—Complete w/Loader, Dust Collector, all switches and starters.

Other good equipment—give us a trial

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Coil handling ram truck 20,000# capacity, automatic electric, 6' lift, used, in excellent condition. Factory Price—$40,000.00—Our Price—$9200.00

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9TH & TIOGA STREETS
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ELECTRIC ARC FURNACE

Lectromelt "More Rapid" Electric Arc Furnace, 2 ton capacity. Top charge. Swing hood. With transformers and controls. Late model. Or will lease furnace and property.

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FOR SALE

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Electromelt Arc Furnace, size Q, Type C, size 16, serial #244, rated at 1½ tons, spare roof, electrode holders, one oil cooled 1200 KVA Allis Chalmers Transformer, serial #714556, 3 phase, inspected 10/15/60 by Allis Chalmers found in good condition, 6900 V primary, 215 V secondary, one control panel switch gear and other electrical equipment, roof and side wall refractory approximately 2500 pcs, one lot carbon electrodes, 6" dia. tapered thread, approximately 40 pcs,—priced to sell $12,000.00 f.o.b. truck or rail.

Gruendler Crusher & Pulverizer, Model XC, swing hammer mill, serial #19402, 25 H.P., 1800 RPM, open drip proof ball bearing motor, capacity approximately 1,000 to 1,500 lbs. hourly when reducing carbon steel turnings size ⅜".

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PHONE: PROSPECT 6-8500

Phone or Write for information ! ! !

FOR SALE

2 Shalco MC-5 Shell Core Machines
1 #400 Clearfield Muller

PIONEER FOUNDRY & MFG. CO., INC.
GILBERTVILLE, MASS.

FOR SALE

Two #4248 Herman Pneumatic Stationmaster Molding Machines. New 1955—used less than one year. Address: AUTO SPECIALTIES MFG. COMPANY, 643 Graves St., St. Joseph, Michigan.

FOR SALE

36" x 42" AMERICAN WHEELABRATOR, Serial No. A68000. Address: WELDON F. STUMP, 4835 Crestridge, Toledo 13, Ohio.

• FOR SALE

FOUNDRY EQUIPMENT

Shell Molding Machine, Model 404 "Shalco"

Sand Blast Cabinet "Wheelabrator" complete with conveyor, speed reducers, starters, pressure tank and shot return elevator, separator and storage hopper.

Furnace, rotary, gas-fired, 1-ton capacity, complete with blowers & motors and speed reducers.

Furnace, rotary, "Hopkins" 10-ton complete with blowers and motors, oil-fired.

Furnace, "Lindberg" Rotary 10-ton complete with blowers and motors, oil-fired.

Briquetting Machine—"Economy" electric, style 112 FC, Serial 24323.

Magnetic Separator—"Dings" 18 x 48 complete with DC unit.

Magnetic Separator—"Dings" 15 x 38" portable, complete with DC unit.

Turnings Crusher "Jeffrey" Model DFMT40, 30 HP motor, 220/440 Volt.

Hoist—2-ton electric, "No. Eng." Hi-Lift.

Hoist—2-ton Electric "Detroit".

Blowers, Spencer Turbine 225 CFM, 12 oz., 1½ H.P. Motor.

Blower, Spencer Turbine 550-CFM, 20 oz., 5 HP Motor.

Blower, Spencer Turbine 1000 CFM, 24 oz., 10 HP Motor.

Potentiometer "Bristol" Range 0-2500.

Bucket Elevators, Hopper.

Conveyor, Roller, 10-Section 10' long, 39¼ wide, overall rolls 2½ diameter on 3-inch Center.

Cupola "Whiting" water jacket, skip-hoist, blower and motor, bucket elevator and hopper.

White Metal melting furnace, pot dia. 28", gas-fired.

Molds for solder and babbitt, water-cooled. Reg. bar, capping bar, octagon and ladles.

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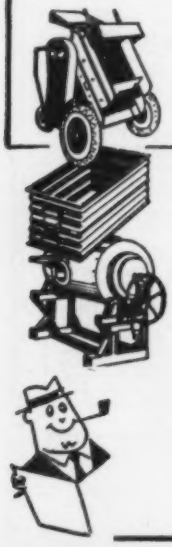
WO. 3-0655 MR. WARD

DETROIT, MICHIGAN



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CLEANING EQUIPMENT
2—72" Swingout tables
2—6 cu. ft Continuous Tumblast
1—42" x 48", 17½ cu. ft. Tumblast with loader
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1—27" x 36" 5 cu. ft. tumblast
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2—EN2 Pangborn Cabinets

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1—3000 lb. Heroult Side Charge
1—500 lb. Lectromelt

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Simpsons #1, 1½, 2, 3, unit drive
Simpsons 2 Portomullers
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B & P #50, 3 mulbaros

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4—25 Tons 2—15 Tons 2—10 Tons
3—3 ton Bottom Pour
3—3 ton T-Pot

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Lindberg, Pit Type: 1—60" x 60" electric . . .
1—38" x 54" electric

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1—B-P 19" head stationary, double belt
1—B-P 19" stationary, riddle type

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FOUNDRY ENGINEERING SERVICE

FOUNDRY EQUIPMENT BY FOUNDRYMEN

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SAND SLINGERS
B & P Tractor type, 6' jib, 4' ram arm, 18" head
B & P Stationary Type 6' Jib, 4' Ram Arm, 18" head, 25 HP

MECHANIZED MOLDING SYSTEM
Jeffrey 16 station Overhead Sand System, includes sand storage, muller, mold conveyor, shakeout and sand return.

JOLT SQUEEZERS
Osborn 275J
International LJS 10"—12"
International PJS 16"
Tabor Top Squeeze 10"
SPO 110J—113J
Champion 10"
Milwaukee 104-5—10"—12"
SPO 2136

JOLT SQUEEZE PIN LIFT
Milwaukee 126 Portable 21 x 27 Table 8" Draw
Milwaukee 145 24 x 30 Table 8" Draw
Osborn 712 18 x 28 Table 6" Draw

International PK18 18" Sq. Cyl 8" Draw 24 x 36 Table

JOLT ROLLOVER DRAW
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International "F" 45 x 72 x 16" Draw
J&J 612, 25 x 30 x 8" Draw
J&J 815, 30 x 40 x 15" Draw
J&J 918, 44 x 54 table 18" Draw
Osborn 405 39 x 63 table
Osborn 242W
SPO 508, 28 x 30 x 9" Draw
Tabor 30 x 50 x 12" Draw Shockless

JOLT PIN LIFT
Davenport 34A, 36 x 46 x 12" Draw
J&J 1216S, 36 x 54 x 16" Draw
J&J 68S, 24 x 30 x 6" Draw
Milwaukee 1536, 32 x 38 x 10" Draw
Osborn 558 20" x 24" x 5" Draw
SPO 3070

JOLT SQUEEZE ROLLOVER DRAW
SPO 9546, 30 x 40 Flask 11" Draw
SPO 920, 32 x 44 Flask 11" Draw
Osborn 332, 26 x 36 Flask 9" Draw

PLAIN JOLTERS
J&J 72 x 72
Tabor 48" x 60"

SAND MULLERS
Simpson Lab Muller, 24"
Simpson Portomuller
Simpson 1½ UD w/or w/o skip hoist
Simpson No. 1, Style "H"
Simpson #2 w/skip (open gear)
Simpson #2 UD w/aerator and skip hoist
Simpson #3 UD auto-cycle, dust hood, etc.
B&P No. 3½ Mulbaro
B&P #60 w or w/o Multromatic
Clearfield #404
Clearfield 610
B&P 50 with skip hoist, cooling and water meter
Simpson No. 3, Style C, enclosed gear with skip hoist.

SAND CONDITIONERS
B&P Screenerators, M. L.
B&P Junior Night Gang
50" Molders Friend
Royer NDP, Royer NC2, Royer JR
American Sand Cutter, various sizes
B&P No. 60 Preparator
3 Newaygo Handy Sandys HS7GT
1 Reddy Sandy

SHAKEOUTS
Simplicity 6 x 8
Newaygo Reddy Sandy
Allis Chalmers 8 x 10
Simplicity 4 x 6
Simplicity 4 x 8

CORE BLOWERS
Redford No. 1 and No. 2
Champion, CB15, CB18
Demmler No. 55, 1, 2K, 3E
Hansberg Shooter
Demmler 103EO w/feeder skip hoist, semi-auto cycle
Ross Vibra—Draws
Federal San Bio Pulsator, Model L40P1LPP
B&P Flexiblo, Model No. CB-10-DH w/ Universal Bio Plate

CORE OVENS
Tower oven, various sizes
Batch type, core & mold drying, various sizes
Porbeck 16-2B double and single end five drawer
Foundry Equipment, single end, 5 drawer
Porbeck C3C Double End and Single End, Oil Fired

CUPOLAS
Whiting Nos. 0, 2½, 4, 7, 9, 10
Cupola Blowers, various sizes
Modern swivel charger
Hauck cupola lighter
Series 1000 Bondactor
Cupoliner Model 1500

LADLES AND POURING DEVICES
Modern, Whiting, all sizes plus mixing ladle, electric tilt, cylindrical and tea pot lip pour

NON FERROUS FURNACES
#60 to #250 Crucible & Iron Pot Furnaces, stationary and tilt
Lindberg Fisher Electric Induction
Reda 1000# power tilt type reverberatory
Stroman 1200# Economelt gas fired
Stroman 1600#/hr. reverberatory, 1 station double chamber reverberatory
6000# Fisher Simplex reverberatory complete, gas fired
Lindberg Fisher NMP nose pour, 1000# capacity, gas fired

CLEANING EQUIPMENT
48 x 72 American Wheelabrator with skip and dust collector

42 x 48 American Wheelabrator
36 x 42 American Wheelabrator with skip & dust collector
27 x 36 American Wheelabrator with skip & dust collector
20 x 20 Air Blast Sly Barrel
36 x 72 Sly Tumbling Barrel, gearmotor drive
48 x 48 American Wheelabrator w/skip hoist
American 20 x 27, with Rubber Belt

GRINDERS
Marschke 2 x 24
U. S. No. 65, variable speed 24"
Gardner 54" surface grinder
Mummert-Dixon Swing 15 HP 3 x 24"
Gardner 36" opposed wheel surface grinder

AIR COMPRESSORS
25 H.P. Air Cooled I.R.
100 HP XRB Ingersoll-Rand 2 stage, horizontal
175 HP XRE 2 stage, synchronous motor
30 HP Ingersoll-Rand horizontal
75 HP Ingersoll-Rand air cooled

AIR HOISTS
Ingersoll-Rand 700#, 1000#, 2000#, 4000#, and 10,000#
Curtis Air Cylinder Hoists

ELECTRIC HOISTS
P & H 500#, 1000#
Comet 500#
Cleveland 1000#
Yale 1000#, 6000#
Budgit 1000#

MATERIAL HANDLING EQUIPMENT
Hough Payloaders HA Models
Hyster Forklift 2000#
Towmotor Forklift 7000#
Baker Electric platform 6000#
D. C. Electric Clamshell 1½ Yard
Clamshell Buckets ¾ & 1 Yard
45" Bolted ECM Magnet
50" Bolted Ohio Magnet
55" Bolted Ohio Magnet
130 of 30" roller conveyor, 3½ rollers, 6" centers, 4" channels
Michigan 12B Front End Loader 39" Magnet

2—3 ton Shepard Niles overhead cab operated cranes, 47' span with runway and motor and generator.

TESTING EQUIPMENT
Pittsburgh Brinell Hardness Tester
Sand Testing Equipment
Speedy Moisture Teller
Detroit HB1 Brinell Hardness Tester

MACHINE SHOP EQUIPMENT
Cincinnati #118 automatic mill
Betts 52" Vertical Boring Mill, 2 loading arms
Bridgeport vertical milling machine
Niles Radial Drill 13" x 5' arm
American Radial Drill 14" x 7' arm
Peerless Power Hack Saws, all sizes

MISCELLANEOUS
Tessmer, Obermayer, Perkins ¾", 1½" blades, sprue cutters
Walker Turner all angle cutoff saw
C & P core knockout
Magnetic Pulleys
Steel Flasks
Slip Flasks, Jackets
500# Print-O-Matic Dial
American Rod Straightener Type F & H

PATTERNS FOR PRODUCT LINE
Approximately 50 matchplates and other patterns to produce a line of brass plumbing supplies, all jigs, fixtures, dies and special tooling, approximately $7000 *cost* stock finished parts on hand, National Sales distribution of products produced, list of customers and sales representatives.

WANTED! GOOD SURPLUS EQUIPMENT . . . . .

One piece or a complete foundry—ferrous or non ferrous

LIQUIDATION SALE

FORMER ALLIS-CHALMERS No. 2 FOUNDRY - NO TIME LEFT TO SELL ON THE PREMISES - ALL ITEMS MOVED TO OUR CHICAGO WAREHOUSES - GOOD USED EQUIPMENT PRICED TO SELL QUICK

AIR RAMMERS
Bench & Floor Rammers

APRON CONVEYORS
Jeffrey no-lead 36" x 48' centers, inclined type, complete
2—Jeffrey no-leak 42" x 12'7", centers

AIR COMPRESSORS
I-R, 100 hp. Air Compressor
2—25 hp. compressor, Worthington

BELT CONVEYORS
Jeffrey 24" x 131' centers, complete
Jeffrey 24" x 90' centers, complete
Jeffrey 24" x 11' centers, complete
Jeffrey 24" x 25'9" centers, complete
Jeffrey 18" x 87'9" centers, complete
2—Jeffrey 18" x 124'5½" centers, complete
18" x 14' centers, complete
21" x 13' centers, complete
18" x 16' centers, complete

BLAST CLEANING EQUIPMENT
Pangborn table cleaning machine, Model LG 6, with 6' table and 24" auxiliary tables complete with dust collector
Wheelabrator 27" x 36" with skip hoist

Wheelabrator 48" x 72" with skip hoist

BONDACTORS & CUPOLA LINERS
Model 1500
Model 1000L

CORE BLOWERS
International, universal head, SB11
Champion, universal head, CB15
Champion, CB10

CORE OVENS
Di-Electric core oven
Drawer type core ovens
Batch type core ovens

CORE ROLLOVERS
SPO, pattern draw, Model R26815 table 36 x 68, Draw 15"

CRANES
Whiting 3½ ton cap. span 22'6" cupola charging type A.C.

CRANE BUCKETS
Hayworth 1 yard D.C.

CUPOLA BLOWERS
All sizes

CUPOLA LOADING SET-UP
Whiting bridge crane 3½ ton cap.
Fairbanks dial scale, 10,000# cap.
Electric mule
Coke hoppers
Sand hoppers

CUTOFF SAWS
Tabor cut-off saw

DUST COLLECTORS
Whiting, hydro-clone, 2 blowers
Roto-Clone, size 8, complete
Pangborn, 6 hoppers, size 11

ELEVATORS, BELT
REX, bucket, 48' centers, belt 14"

FURNACE
Whiting 25 ton, cradle, complete with pulverizer, hopper, etc.

FURNACES, MELTING
4—Fisher 1000 lb. cap. hand T.H. gas
Fisher 300 lb. cap. MNP, gas

GRINDERS
McArthur, double end
Safety wheel, double end, wheels
24" x 3" x 12" on 58" centers on 34" height
2—Bridgeport, double end
Ransom, back stand
Diamond face grinder
Gardner horizontal grinder

HOIST, ELECTRIC
2—P & H, 2 ton cap. cable type
1—1 ton motor-rail, with cab

HOISTS, AIR
Ingersoll-Rand cap. 2000#
Ingersoll-Rand cap. 1000#
Ingersoll-Rand cap. 4000#

JOLT SQUEEZERS
8—Milwaukee, swing head, table size 17" x 26", 300# cap., cyl. 12"
2—International, table size 17" x 20"
International, 22" x 24½"
Milwaukee, table size 17" x 21"
Milwaukee, table size 17" x 26"
5—Osborn, cantilever head, Model 275PJ

JOLT SQUEEZE STRIP MACHINES
4—Milwaukee, table size 21" x 27", draw 8", 500# cap., cyl. 12"
5—International PK18 x 8, table size 24" x 36", draw 18"
5—SPO, table size 22" x 30", 6" draw, Model 2136
SPO, Model 2138C

JOLT, SQUEEZE, ROLLOVER DRAW
SPO model 9546

JOLT PIN LIFTS
SPO Model 3072
J&J, Model 8125, table 30" x 38"
Davenport

JOLT TABLE
2—International plain jolt 18" x 20" 4" cyl.
4—International plain jolt 24" x 30" to 36" x 48"

LADLES
6—Whiting tapered lip pour, enclosed gearing, size 28" x 28"
4—Whiting cylindrical, enclosed gearing, size 35" x 27"
6—Tapered ladle, lever type, lip pour, 15" x 15"

MAGNETIC PULLEY BELT CONVEYORS
Jeffrey 18", belt 24", 32' centers
Jeffrey 18", belt 24", 44' centers

MATERIAL HANDLING EQUIPMENT
3—Hough Payloader, Model HA
Michigan front end loader ¾ yd.
Tractomotive front end loader ½ yd.

MOLD CONVEYORS
2—Jeffrey mold conveyor line, 352' lg. 88 cars, 23" x 41", 48" centers, comp. with cooling tunnel
1—Jeffrey mold conveyor line 509' long 101 cars, roller table top, on 5'1" centers, speed 4' to 16' per minute complete with cooling tunnel and fan

MULLERS
3—Simpson No. 3, 3000# cap., enclosed gear
Simpson No. 1½, U.D.
Simpson No. 1, U.D.
2—Simpson No. 1, open gear
Simpson No. 1, enclosed gear

PULVERIZERS
Whiting, Model 30, complete
Whiting, Model 30A, complete

ROLLER CONVEYOR
6"—8"—14"—26"—30"—36" close centers

ROLLOVERS
J&J Model 918
International, Model 30 x 8
International, Model 24 x 10G

SCALES
Fairbanks, dial type, 21,250# cap.
Fairbanks, crane type scale, 10,500# cap.
Fairbanks, dial type, 10,000# cap.

SCREENS, VIBRATING
Allis-Chalmers, 4' x 8', complete

SHAKEOUTS
All sizes & types

SLAG DISPOSAL
Complete unit, tank, conveyor, belt conveyor and hopper

SAND CONDITIONERS
Bop, Model S
Royer, Model D8-29

SAND SLINGERS
B&P Tractor type

STORAGE BINS
2—Jeffrey sand storage, hoppers 10' x 12'
Jeffrey coke type hopper, double bins 25' x 25', complete with Fairbanks dial scale
Hopper 10' x 10" with gate

SWING GRINDERS
Safety swing grinder, 7½ hp.
FOX, 18" x 2" x 7" wheel, 10 hp.
MARSCHKE, 15 hp. 24" x 3" wheel

SAND SYSTEM EQUIPMENT
All sizes & types

SPRUE CUTTERS
3—Tessmer

TUMBLING BARRELS
3—Whiting, 36" x 72", complete, 7½ hp

TESTING EQUIPMENT
Dietert lab equipment
Detroit hardness tester
Rockwell hardness tester

TRANSITE CORE PLATES
6" x 6" to 24" x 30"

For Information Contact EARL GREENE

WEISS STEEL CO., INC.

600 W. JACKSON BLVD. CHICAGO, ILL. • CEntral 6-1936

WE WILL BUY OR TRADE YOUR SURPLUS EQUIPMENT—ONE PIECE OR AN ENTIRE PLANT

Universal* MACHINERY AND EQUIPMENT CO.

. . . large enough to serve you, small enough to know you.

1632 North Ninth Street
Reading, Pa., Franklin 3-5103

• AIR COMPRESSORS
75 hp I.R. water cooled, horizontal
100 hp WORTHINGTON air cooled, 2 stage

• BLOWERS
CENTRIFUGAL 5 Hp to 30 Hp
GE, WILBRAHAM—GREEN FISHER Positive Pressure & Cent., Cupola Blowers

• BLAST CLEANING EQUIPMENT
15" Cont. WHEELABRATOR Tumblast
26" Cont. WHEELABRATOR Tumblast
15" x 20" WHEELABRATOR Tumblast
27" x 36" WHEELABRATOR Tumblast
36" x 42" WHEELABRATOR Tumblast
48" x 42" WHEELABRATOR Tumblast
48" x 48" WHEELABRATOR Tumblast
48" x 72" WHEELABRATOR Tumblast
1-A WHEELABRATOR Multi-table
72" WHEELABRATOR Swing Table
No. 2 WHEELABRATOR Multi-table
WHEELABRATOR Pipe Cleaning Cabinet
WHEELABRATOR Sheet Cleaning Cabinet, handles up to 48" wide stock
PANGBORN 8' LF Table
PANGBORN Air Blast Room 6' x 8'
6' LK PANGBORN Table Room
6' LG PANGBORN Table
9' LG PANGBORN Table
DUST COLLECTORS AND SKIP LOADERS AVAILABLE FOR ALL MACHINES

• CONVEYORS
CARRIER Oscillating, 18" W x 54' L
LINK-BELT, Car type mold, 114 cars, 403' track, car sizes 18" x 42"
SIMPLICITY 17" W x 11' L, Model OA-10-KA Feeder
SIMPLICITY 24" x 10' Feeder w/hopper, Model OA-10-JA2
Roller Conveyor—Ask for List

• CORE BLOWERS
DEMMLER #1, #2, #2A, #3K
INTERNATIONAL SB-13
OSBORN #91, #192, #91-10
SAN-BLO #40-P-1, 40# core
TACONNE #4D, 10" Draw Stroke Cyl.

• DUST COLLECTORS
COMPLETE STOCK both Bag & Wet Types, 1000 to 17000 CFM

• FURNACES
DIRECT ARC MELTING
250 lb. LECTROMELT, Side Charge
500 lb. LECTROMELT, 200 KVA trans.
1000 lb. SWINDELL
2000 lb. HEROULT
2000 lb. SWINDELL, 3/60 1000 KVA
1½ Ton HEROULT
11' Top Charge Furnace
INDIRECT ARC MELTING
10# DETROIT
350# DETROIT LFA
750# DETROIT LFY, Conical Shell
1000# DETROIT AA
3000# DETROIT C, 500 KVA
INDUCTION MELTING & HEATING

700 KW AJAX Induction Mltg. Unit comp. w/six 500# mltg. fces., 1000 Hp M.G. set, control panels, transformer, circuit breakers.
LATE TYPE in Like New Condition
2 tons/hr. capacity
Send for complete details

30 KW, ECCO Hi-freq. Vacuum Melting
30 KW, LEPEL, water cooled spark gap
35 KVA, AJAX Spark Gap, High Freq.
50 KW to 200 KW TOCCO Units
100 KW AJAX Production Heat Unit
GAS & OIL FIRED
400# & 600# FISHER, MNP
1000# HAUSFELD Hand Tilt, Oil fired, alum or magnesium
1—#900 JC STROMAN, gas, Like new
6000# STROMAN, gas fired
20 Gas & Oil Fired Furnaces
HEAT TREATING
4' x 4' x 10' Gas Fired Annealing
9' x 12' Car Type, gas/oil
210 KW LINDBERG conveyor box type
7' Rotary G.E. 200 K.W., 1950° F
36" x 36" West. Pit Type Electric
10" x 12" x 24" LINDBERG, 2500° F. Hyd
42" x 73' G.E. Roller Hearth, 1950° F.
36 x 96, 48 x 120, 48 x 144 gas fired
Large Stock Gas Fired Box Heat Treating Furnaces

• PIT TYPE ANNEALING
42 x 96, 42 x 120 recirculating gas fired

• GRINDERS
DOUBLE END
3 Hp HISEY WOLF 3/60/220
5 Hp U.S. Model 64, 3/60/220
7½ Hp U.S. Model 66 3/60/440
15 Hp MARSCHKE 220 volt
25 Hp KLING 3" dia. shaft
SWING FRAME
7½ Hp MUMMERT-DIXON 2/60/220-440
10 Hp SAFETY 24" x 3" wheel
15 Hp MARSCHKE 3/60/220-440
15 Hp MUMMERT-DIXON

• LADLES
BOTTOM POUR
MODERN, 49" x 49"
MODERN Crane Type, 55" H x 50" top
MODERN Crane Type, 60" H x 60" top
LIP POUR
WHITING 28" x 28" top dia. geared
WHITING 29" x 29" top dia. geared
WHITING 52" x 52" top dia. geared
WHITING 33" x 33" top dia. geared
CYLINDRICAL
WHITING, 26" L x 25" dia, 1100# iron
WHITING, 19" L x 22" dia, 600# iron
WHITING, 38" L x 28" dia, 2200# iron

• MATERIALS HANDLING
BYERS Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech, dump

• OVENS
COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22' x 12' x 10'
GIRDLER Thermex Dielectric Core Oven, 15KW w/36" W mesh belt
THERMONIC Dielectric Core Oven, 18 KW, w/40" wide mesh belt

• PRESSES
40 Ton FERRACUTE Sprue Cutter 1½" stroke
125 ton R.D. WOOD Down acting, 9" stroke
NIAGARA No. 82 Punch Press

• SAND CONDITIONING
B&P Nite-Gang
B&P Screenarator, Model "M"
LINK-BELT Revivifier
ROYER, NC-2, 10-15 tons/hr. 1½ Hp
ROYER PREPARATOR, Comb., Model NDC, 25 ton/hr scrap removal 8' x 8' hopper
ROYER, NDP, 15-25 tons/hr, 2 Hp
ROYER, "NRP," 40-60 tons/hr, 5 Hp.

• SAND SLINGERS
B&P Stationary, Single Speed
B&P Tractor Type 16" Head
B&P Tractor Type 19" Head
B & P Motive Speed slinger, 2 speed, 22" head, 5" tip

• TESTING MACHINES
3000 Kg Gogan Brinell Testers

TOCCO SALE — INDUCTION HEATING UNITS

2—50 KW TOCCO 9600 cycle, 100 Hp motor
3—50 KW TOCCO JR, 2 station, 9600 cycle, 90 Hp motor
2—80 KW TOCCO JR, 2 station, 9600 cycle, 140 Hp motor
4—100 KW TOCCO JR. 2 station, 9600 cycle, 175 Hp motor
2—200 KW TOCCO JR. 1 station, 3000 cycle, 310 Hp motor

• MOLDING MACHINES
JOLT ROLLOVER PATTERN DRAW
DAVENPORT #408A, 40" x 60" table,
HERMAN 10,000# 48" x 109" table
HERMAN 6000#, 42" x 78"
HERMAN 7500#, 40" x 50" table
HERMAN 3000#, 30" x 66" table
HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type
HERMAN 1500#, 30" x 48" table
INTERNATIONAL 27" x 16", Type F, 22" x 64" table
INTERNATIONAL 31" x 16", Type F, 28" x 78" table
INTERNATIONAL 30" x 12", Type G, 28" x 35" table
INTERNATIONAL 13" x 17" table
INTERNATIONAL 43" x 16", type F, 42" x 72" table
J & J #610, 24" x 30" table
OSBORN #243-W, 35" x 40"
OSBORN #602, 36" x 26", 900#
OSBORN #405, 3000#, flask 64" x 57"
TABOR 40" x 60", 1500 & 3000#
TABOR 22" x 42" pattern draw shockless, portable 600#
TABOR 20" x 30" w/air clamp 1000#
TABOR 14" x 16" Rockover 150#
TABOR 40" x 50" table, 3000# capacity
PLAIN JOLT
INTERNATIONAL, 3' x 4' Table, 12" cyl.
TABOR 3' x 4' table
JOLT PIN LIFT
HERMAN #1317, 22" x 30" table
OSBORN #540, 29" x 38" table
SPO #3058, 23" x 27" table
SPO #305, 750 lb. 20" x 27" table
TABOR 20" x 24" table, 600#
JOLT SQUEEZE PIN LIFT
INTERNATIONAL PKL, 20" x 28" table, 14" sq. 5½" draw
INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
MILWAUKEE #165, 24" x 30" table, 16" sq., 1700#
NICHOLLS 18-44, 6½" draw
OSBORN, #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
OSBORN #716 PJ, 22" x 24" table 16" sq., 8" draw
SPO #2114P, 21" x 27" table, 600#
SPO, #2116, 21" x 27" table, 11" sq.
JOLT SQUEEZERS
INTERNATIONAL #12 LJS, 16" x 20"
OSBORN #275J, 16" x 20" table, 400#
SPO #110J, 17" x 20" table, 400#
SPO 113PJ, 18¼" x 26" table
TABOR Squeeze-in Head, 16" x 19" table
TABOR Yoke Type, 18" x 26" table

• MULLERS AND MIXERS
B&P #30 Speedmuller w/skip, 3 cu. ft.
B&P #40 Speedmuller w/skip, 5 cu. ft
B&P Conventional, SIMPSON type, 87½" Dia., arranged for cooling
B & P #70 Speedmuller, 15 cu. ft. w/cooling
CLEARFIELD #920, 9' dia., 30 cu. ft.
CLEARFIELD #610, 6' dia., 14 cu. ft.
SIMPSON, #0, U.D., 3' Dia.
SIMPSON #1, U.D., 4' dia., 4 cu. ft.
SIMPSON #1, Sep. Dr., 4' dia., 4 cu. ft.
SIMPSON #1½, Sep. Dr., or U.D. 4'6" dia., 6 cu. ft.
SIMPSON #2, U.D., 6' dia., 14 cu. ft.
SIMPSON #2, enc. gear or open gear, 6' dia., 14 cu. ft.
SIMPSON #3, 8' Dia. Sep. Dr., 30 cu. ft.
WHIRLMIX, 31" dia., 200 to 300 lb. sand

• SHAKEOUTS
2' x 10' HEWITT-ROBINS
3' x 10' SIMPLICITY
4' x 5' SIMPLICITY
4' x 6' SIMPLICITY
4' x 8' SIMPLICITY
5' x 6' HEWITT-ROBINS

• TRANSFORMERS (Furnace)
100 KVA KUHLMAN 13.200, 1/60
250 KVA WESTINGHOUSE 6600, 3/60
300 KVA WAGNER 4600, 1/60
500 KVA KUHLMAN 13.200, 1/60
800 KVA PENNA, 23.000, 3/60
1000 KVA WESTINGHOUSE 23,000, 3/60
1000 KVA G.E. 13,200, 3/60
2000 KVA WESTINGHOUSE 13.200, 3/60
5000 KVA WESTINGHOUSE 2300, 3/60
7500 KVA PENNA, 13.200, 3/60

• MISCELLANEOUS
BLASTCRETE Model PM-1 Cupola Gun
FLASKS, CORE PLATES, All Sizes
CLIMAX Model 2-A Wire Straightener
CRESCENT Band Saw, 32" wheels
45" Magnet 230V, D. C.
SLY Rd. Tumb. Barrels 68" x 32", 48" x 36"
MOULDER'S Hoppers, Various Sizes
TABOR 10 HP Cut-off Saw

* Your ***DEPENDABLE*** Foundry Equipment Dealer

PARTIAL LISTING OF EQUIPMENT NOW AVAILABLE — INQUIRIES INVITED

SAND MULLERS

CLEARFIELD

MODEL	PAN. DIA.	CAPACITY
404	4'	400 #
610	6'	1500 #

BEARDSLEY & PIPER

MODEL	CAPACITY	AIR COOLED
30	4 cu. ft.	Yes
30	4 cu. ft.	No
60	12 cu. ft.	Yes
60	12 cu. ft.	No
70	15 cu. ft.	No
80	20 cu. ft.	Yes

ALL CAN BE EQUIPPED WITH DUST HOODS, SKIP HOIST LOADERS, MULTRAMATIC CONTROLS, ETC.

SIMPSON

MODEL	PAN. DIA.	CAPACITY	DRIVE
1½	4'-6"	700 #	UD
2	6'	1500 #	Encld.
3	8'	3000 #	UD
3	8'	3000 #	Encld.
3½	9'-3"	5000 #	UD

ALL CAN BE EQUIPPED WITH NATL. ENG. STRAIGHT LIFT SKIP HOIST BUCKET LOADERS.

LANCASTER

MODEL	PAN. DIA.	CAPACITY
EA4	59"	9 cu. ft.
EBG-4	59"	9 cu. ft.

OSCILLATING CONVEYORS

AJAX ENGINEERING (Lo-Veyor)

MODEL	SIZE	CAPACITY in T P H
LC 18-6-24	18" W x 24' L	50
LC 24-6-7	24" W x 7' L	70
LC 24-6-21 FA	24" W x 21' L	70
LC 36-6-9DA	36" W x 9' L	100
LC 36-6-14 DA	36" W x 14' L	100

SIMPLICITY ENGINEERING

OA-10-JA	24" W x 13' L	150
OA-10-JA	24" W x 11' L	150
OA-10-JA-2	30" W x 7' L	150
OA-10-JA	30" W x 13' L	100
OA-10-JA	36" W x 6' L	150
OA-10-A	36" W x 10' L	200
OA-10-A	36" W x 16' L	200
OA-10-A	36" W x 25' L	600

SANDSLINGERS

B&P Stationary, Model "DB," 5' jib arm, 4' ram, 19" head, 5" cup, 2-speed, 20/13 HP. Raising & lowering arms or fixed.
B&P Stationary, Model "DB," 8' jib arm, 4' ram, 19" head, 4" tip, 20/16 HP. Raising & lowering arms or fixed.
B&P "Motive Jr.," 11' jib arm, 4' ram, 16" head, 4" cup, R & L arms, 2-speed, 20/13 HP.
B&P "Motive," 15' jib arm, 9' ram, 2-speed, 25/16 HP. With Raising & Lowering.

HANDY SANDYS

NEWAYGO SHS-4-G Super Handy Sandys, Single Hopper, 15 cu. ft. capacity, 4' receiving hopper, air gates, 21' center elevator.
NEWAYGO SHS4-GT Super Handy Sandy, Twin Hoppers, 25 cu. ft. capacity, 4' receiving hopper, 21' center elevator.
NATIONAL ENGINEERING Moulders Helper. Twin Hopper, 3000 # capacity, each air operated gates.

CUPOLA BLOWERS

INGERSOLL RAND

MODEL	C F M	PRESSURE	HP
FS-337	3000	20 oz.	25
FS-345	4500	16 oz.	30
FS-355	6000	16 oz.	40
FS-587	10,200	20 oz.	75
FS-377	10,500	20 oz.	85
FS-585	14,100	40 oz.	200

ROOTS CONNERSVILLE

RCR	1040	20 oz.	10
RCB	9075	32 oz.	100

SPENCER TURBO

Cont.	7500	48 oz.	150

RAREST OPPORTUNITIES! LATEST DESIGN & METHOD! NOW AVAILABLE!

These listed below are exceptional purchases we have been fortunate in making during the last 30 days. Equipment of this caliber has never been offered on the Used Market. Savings of 40 to 60%. Machinery a few years old.

DIELECTRIC CORE OVEN

1—COLEMAN Model CD-75 Dielectric Core Oven 10' Wide 40' Long x 7' High—Mesh Belt Conveyor Type. Belt width 5'—Work area 64" Width x 19" High opening. Power required 165 KVA, 3 Phase, 60 Cycle. 460 Volts. Unit new in 1957 and used less than 3 years. Acquisition cost over $44,000.00—In Like New Condition—Save more than 50%.

TUMBLAST

1—AMERICAN 48" x 72" Tumblast. 30 Cu. Ft. load cap. Complete w/skip hoist loader and all electrical. Serial #A99334. New 1956—Used very little.

SHELL MOLD EQUIPMENT

2—SHALCO Model MC-3 Shell Core Blowers. Core box cap. 6" x 12" x 10"—Output 60-80 cores per hour. 1956 machines.

SAND MULLERS

1—B&P #50 Speedmullor. 12 Cu. Ft. Batch Cap. Air Cooled. New 1950.
1—B&P #70 Speedmullor. 18 Cu. Ft. Batch Cap. Air Cooled, w/Skip hoist loader. New 1951.
1—SIMPSON #1-F Sand Muller, 50" pan dia. 5 to 7 Cu. Ft. Cap., w/dust hood. New 1960—Used 3 months.
3—SIMPSON #2-F Sand Mullers, 80" pan dia. 2000 # batch cap. New 1955, little usage.
1—CLEARFIELD #920 Sand Muller, 9' pan dia., 3000 # batch cap.

INDUCTION MELTING FURNACES

TOCCO 200 KW Induction Melting System, w/200 KW Gen. 3000 cycle, 800 volts. Complete w/M.G. Set, Heat Station Control Station, etc. 2 Furnaces—500 # & 50 # cap. for steel & alloys. New 1952.
2—AJAX 20 KW Induction Melting Furnaces, Convertor type, 3000 cycle, w/two 20 # furnaces.
5—AJAX 150 KW Induction Melting Furnaces, 440 V, 60 cycles. 1000 to 1200 # brass cap.
6—AJAX Model CS-1 35 KW Induction Melting & Holding Furnaces. 800 # holding cap., 175 # melting cap.

ELECTRIC DUPLEXING FURNACE

1—WHITING 10 ton Hydro-Arc Furnace for Duplexing Malleable Iron from cupola, 10' dia. shell, motorized tilt 9" dia. electrodes, cap. 18 to 23 ton per hour, w/Allis-Chalmers 2000 KVA transformer, 12,000 volt-motorized tap changer. Unit new 1953.

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QUAN.	MODEL NO.	CAP.	PRICE
6	A	500 #	259.50
5	B	1000 #	279.50
17	C	2000 #	439.50
21	D	4000 #	539.50
13	D-6	6000 #	739.50
7	E	10,000 #	939.50

All equipped with top hooks for hanging; A-430 Trollies and Air Trollies, Extra. Discounts if purchased in quantity.

JOLT ROLLOVER PATTERN DRAW

DAVENPORT

MODEL	TABLE SIZE	DRAW	CAP.
24 SA	24" x 38"	12"	1000 #
28 SA	28" x 40"	12"	1500 #
34 A	34" x 58"	15"	2500 #
48 A	48" x 82"	24"	6000 #

INTERNATIONAL

AN	40" x open	20"	4500 #

JOHNSTON & JENNINGS

6x2	24" x 30"	12"	600 #
815	30" x 40"	15"	1200 #
918	44" x 54"	20"	2000 #
920-RC	44" x 54"	20"	2000 #
1020-RC	50" x 60"	20"	3000 #

OSBORN

242-W	29" x 42"	12" to 19"	1500 #
244	35" x 52"	16" to 25"	3000 #
405	57" x 64"	26"	3000 #
442	21" x 31"	10"	600 #
601	24" x 30"	10"	900 #
602	30" x 36"	12"	1200 #
643	35" x 50"	20"	2000 #

SPO

505	18" x 23"	6½"	400 #
506	24" x 25"	10"	600 #

TABOR

MODEL	TABLE SIZE	DRAW	CAP.
22"	22" x 32"	10"	600 #
22"	22" x 42"	10"	600 #
30"	30" x 40"	12"	1000 #
40"	40" x 60"	15"	3000 #

JOLT PIN LIFT MACHINES

DAVENPORT

MODEL	TABLE SIZE	DRAW	CAP.
34 A-JB	36" x 46"	12"	2500 #

INTERNATIONAL

JDP 1200x8	24" x 26"	8"	1200 #
JDP 3000x10	48" x 48"	10"	3000 #
JL	32" x 52"	12"	2000 #

JOHNSTON & JENNINGS

6S-SP	25" x 30"	8"	600 #

MILWAUKEE

1030	28" x 34"	8"	1600 #
1536	32" x 38"	10"	1500 #
2036	32" x 38"	10"	2000 #
2542	38" x 42"	12"	3000 #
3548-6	44" x 46"	12"	3500 #

OSBORN

540	32" x 52"	12"	2000 #
560	32" x 45"	12"	2500 #

SPO

3070	28" x 35"	10"	1500 #

JOLT SQUEEZE PIN LIFT MACHINES

MODEL	TABLE SIZE	DRAW	DIA.	CAP.
PKL-12	18" x 24"	5½"	12"	600 #
PKL-14	20" x 28"	5½"	14"	1000 #
PK-16	20" x 30"	8"	16"	1700 #

MILWAUKEE

125	21" x 27"	8"	12"	1200 #
145	24" x 30"	8"	14"	1700 #
195	28" x 39"	10"	19"	3000 #
196	16¾" x 39"	10"	19"	3000 #
244	22" x 32"	12"	24"	3000 #
245	35½" x 42"	12"	24"	5000 #
246	23½" x 42"	12"	24"	5000 #

OSBORN

710-PJ	16" x 25"	6"	10"	500 #
712-PJ	18" x 28"	6"	12"	750 #
714-PJ	20" x 31"	7"	14"	1000 #
716-PJ	22" x 34"	7"	16"	1250 #

SPO

2114-P	20" x 27"	4"	11"	600 #
2136	21" x 30"	6"	13"	800 #
2146	23" x 31"	6"	14"	1000 #

JOLT SQUEEZE ROLLOVER DRAW

MODEL	TABLE SIZE	DRAW	CYL.	CAP.
MILWAUKEE				
167	32" x 33"	12"	16"	1000 #
OSBORN				
332	26" x 36"	9"	16"	750 #
333	32" x 45"	11"	19"	1400 #
SPO				
413-C	24" x 25"	10"	13"	600 #
917-A	26" x 38"	9"	17"	750 #
9545	26" x 32"	12"	16"	1000 #

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GE 7500 cfm., 20 oz., 89.6 h.p., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 h.p.
GE Centrifugal 6200 cfm., 24 oz., 58 h.p.
6000 cfm. INGERSOLL-RAND 32 oz.
SPENCER 3500 cfm., 20 oz., 40 h.p.
SPENCER 2250 cfm., 16 oz., 15 h.p., 220
SPENCER 1350 cfm., 32 oz.
NORTH AMERICAN 1050 cfm, 16 oz.
NORTH AMERICAN 850 cfm.
500 cfm NORTH AMERICAN 12 oz.
McKee 200 cfm
2—SPENCER Turbo 50 hp 4800 cfm 24 oz.
2—SPENCER Turbo 50 hp 3600 cfm 24 oz.

CLEANING EQUIPMENT
27" x 36" American w/skip
48" x 48" AMERICAN w/skip
6' Table PANGBORN
AMERICAN #2 Tablast 8-28" tables, late
PANGBORN GD1-Airblast Barrel
20" x 27" AMERICAN
PANGBORN 53EN2 Reach in cabinets
SLY #4 Blast Mills

CONVEYORS
17' BARBER GREEN Bucket Conveyor
1500'—458 Chain w/drive, will sell all or part

CONVEYORS, OSCILLATING
24" x 40' Ajax
SIMPLICITY 18" x 24'
SYNTRON 24" x 6'
AJAX 12" x 20'6"
36" x 11' Ajax
8" x 13' Ajax

CORE BLOWERS
CB15 55# cores, Universal blow plate
DEMMLER #50
1—DEMMLER #55 w/vibratory hopper
2—DEMMLER #55 w/plain hopper
DEMMLER 2EO
DEMMLER 2K
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL 8B 15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL 8B 13, up to 60# cores
6—OSBORN 193 up to 50# cores
REDFORD Bench #2 & #4

CORE GRINDERS
1—MILWAUKEE 70-9 & 70-12's

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
2—Despatch ET. Drawer Type

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
SUTTER #500

CRANES
2—WHITING 10 Ton cap. 107'3½" span, OETC Outdoor type
1—WHITING 3 Ton OETC Cupola Charge Crane, 20' span

CUPOLA GUNS
1—Bondactor #1250 and 1000

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UNUSED DEWALT CUTOFF SAWS for ferrous or nonferrous metals cutoff or as sprue cutters. Flush blade adapter takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & Sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting or large work. Motor swivels horizontal to vertical in yoke.

DUST COLLECTORS
PARSONS 40,000 cfm, cloth bag type
ROTOCLONE 8D 2000 cfm 5 hp

ELECTRIC MELTING FURNACES
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.

FURNACES
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600# Fisher Stationary
600# Campbell Hausfeld Brass

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U.S. #70 Comb. 20" disc & 20"x3"x1½" wh
GARDNER 18" single end disc.
Porter Cable BG 8 8" belt
72" Gardner Horizontal Disc
53" Hanchett Horizontal Disc
GARDNER 36" Vert Disc
BRADFORD Metalmaster 18" Disc

GRINDERS, SNAG
US #64 D.E. 20" x 3" x 10"
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2—KLING type RT H.D. 24" x 3" x 12" D.E.
KLING H.D. 20" x 2" x 7" D.E.
5—#6 FOX Single Wheel 24" Snag
U.S. #65 D.E. 30" x 3" x 12"
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25 KW Westinghouse 2000°

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35 KW Ajax Tama Wyatt, 60 cycle induction holding furnaces

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4000# Industrial Holding
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MODERN 1000#—Geared Covered Crane
9—MODERN FA9 Pouring Devices 2000# cap.

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MOLD CONVEYOR
366'—51—44" x 66" cars

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JOLT SQUEEZE PIN LIFT
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff—rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw. Flask size 25½" to 29" wide, 52" long. FACTORY REBUILT.
2—MILWAUKEE 165, 24" x 30", 8" draw
MILWAUKEE No. 145-2, 27" x 30" table
8—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw

JOLT SQUEEZERS
MILWAUKEE 181-7, 24" x 36" table
MILWAUKEE #162—1, 900 lbs. cap.
2—113 PJ SPO
OSBORN 275PJ
25—124 MILWAUKEE Portable Jolt Sq.
6—104 MILWAUKEE Portable Jolt Sq.
2—CHAMPION JSL10P 18" x 21" table
8—MILWAUKEE 103-5 17" x 26" table

JOLT ROLLOVER DRAWS
2—918 J & J 2000# cap. 20# draw
812 J & J 1200# cap. 12" draw
643 OSBORN 2000# cap. 29" draw
40" TABOR 2000# cap. 15" draw
30" TABOR 1000# cap. 12" draw
40A DAVENPORT
DAVENPORT 248A 900# 24" x 28" table
HERMAN 3000#
2—750# HERMAN 20" x 30" table
INTERNATIONAL RJ 20" x 12"

JOLT SQUEEZE ROLLOVER DRAW
OSBORN 331-332-333
SPO 413D
INTERNATIONAL RES
SPO 9032

PLAIN JOLT
36" x 60" Herman

JOLT PIN LIFTS
1536 MILWAUKEE 1500# cap. 12" draw
1030 MILWAUKEE

MULLERS and MIXERS
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3—#2 Simpson UD
#40 B & P w/skip and water meter
#60 B&P w/spare parts, mtr. & starter
CLEARFIELD #404
1—#2 SIMPSON OG
CLEARFIELD #610

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ROYER NDC—ND2
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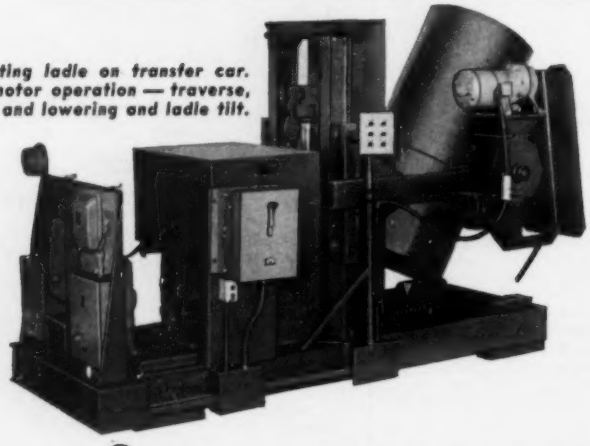

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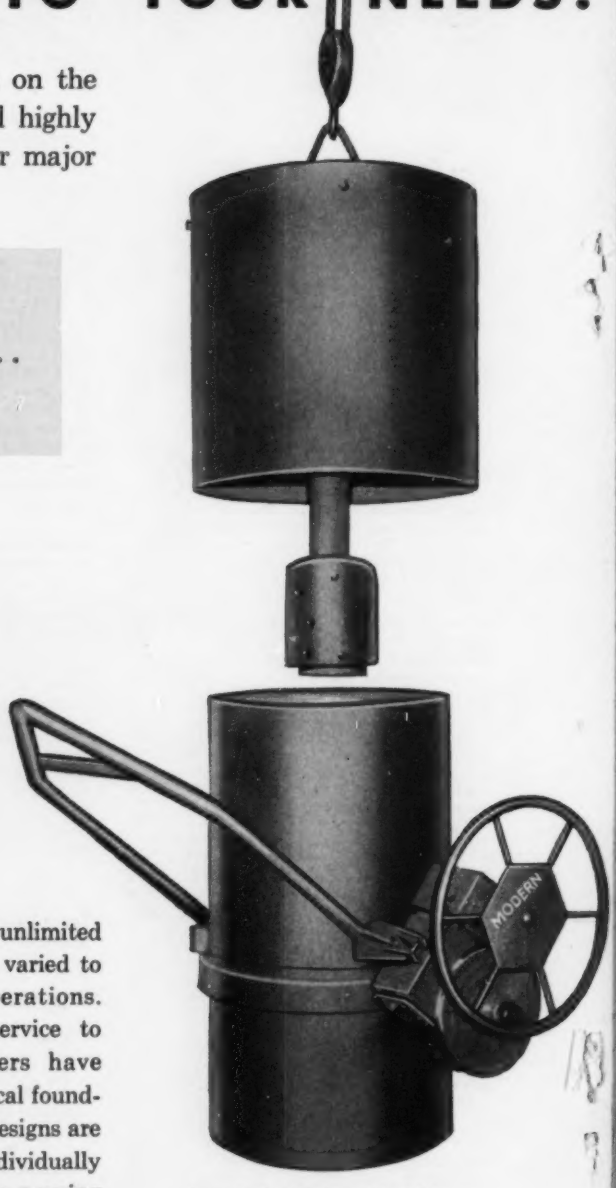

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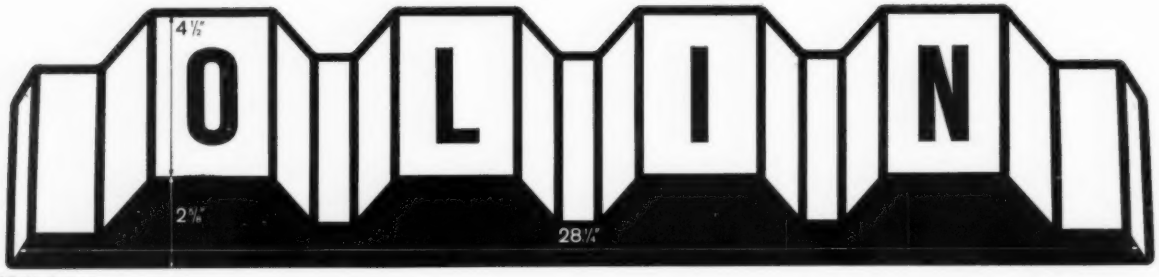

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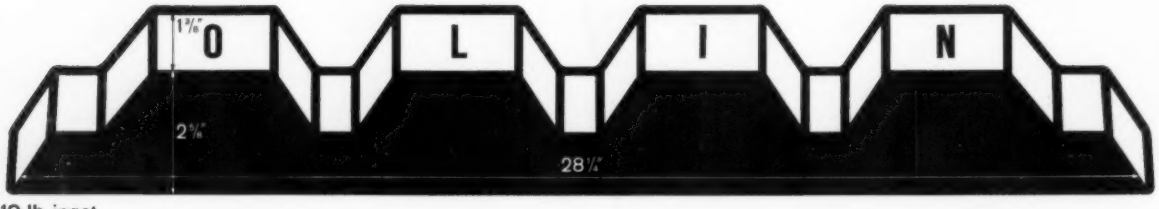

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